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FRENCH'S

# MENTAL ARITHMETIC.

NEW-YORK:
HARPER & BROTHERS

IN MEMORIAM

John Swett

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FRENCH'S MATHEMATICAL SERIES.

# MENTAL ARITHMETIC;

COMBINING A

## COMPLETE SYSTEM OF RAPID COMPUTATIONS,

WITH

## CORRECT LOGIC OF THE SOLUTIONS OF PROBLEMS, AND THE ANALYSES OF PROCESSES.

BY

JOHN H. FRENCH, LL.D.

*Mental Arithmetic is the Logic of the Common School.*

NEW YORK:
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# PUBLISHERS' NOTICE.

## FRENCH'S ARITHMETICS.

This Series consists of Five Books, viz.:

I. FIRST LESSONS IN NUMBERS.
II. ELEMENTARY ARITHMETIC.
III. MENTAL ARITHMETIC.
IV. COMMON SCHOOL ARITHMETIC.
V. ACADEMIC ARITHMETIC. (*In preparation.*)

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The Publishers present this Series of Text-Books to American Teachers, fully believing that they contain many new and valuable features that will especially commend them to the *practical* wants of the age.

The plan for the Series, and for each book embraced in it, was fully matured before any one of the Series was completed; and as it is based upon true philosophical principles, there is a harmony, a fitness, and a real progressiveness in the books that are not found in any other Series of Arithmetics published.

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# PREFACE.

PREVIOUS to the introduction of the study of Mental Arithmetic into American schools, pupils were seldom required to give reasons for processes of computation; and few teachers could be found, who could give any reason for an arithmetical process other than "The rule says so." The publication of Warren Colburn's First Lessons, in 1826, marked the beginning of an era of progress in the art of teaching. The use of that book turned the attention of teachers to two facts, viz: *1st.* That for every arithmetical process there is a reason; and *2d.* That it is quite as important that pupils learn the *why* as the *how*.

The general principle that reformers go to extremes, found no exception in the case of the introduction of the study of Mental Arithmetic into our schools. The chief aim of some teachers of this subject seems to have been, to see how much a child could be made to say, in solving a problem, rather than to cultivate his power to combine numbers, and his ability to explain processes and state reasons clearly, concisely, and understandingly. By this class of teachers, much talking has been regarded as indispensable to good scholarship in this subject. But, within the past ten years, many prominent educators in different sections of the country have had sufficient independence to question the value of the discipline resulting from lengthy solutions, recited from memo-

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rized formulæ, and to test the comparative value of these with concise processes, which appeal constantly to the reason and understanding of the learners. It is scarcely needless to remark that, wherever these tests have been made, they have resulted in favor of concise methods of solution.

The objects for which children should study Mental Arithmetic are two, namely: *First.* To acquire accuracy and rapidity in combinations; and *Second.* To acquire the power to reason correctly. The attainment of this second object will give them the ability to combine a process with a reason, and to frame logical statements adapted to the solution of problems, which shall be clear, concise, and correct. In the preparation of this work these two objects have been kept constantly in view. The attention of teachers and parents is especially invited to the following general plan and distinctive features of the work:

**General Plan.**—The book is divided into eight chapters, the first one of which is devoted to combinations in integers in which no result exceeds 100, and is called a First Course in Integers; the second chapter is a Second Course in Integers, and embraces combinations in which the results do not exceed 1,000; the third chapter is devoted to United States Money; the fourth to Compound Numbers; the fifth to Fractions; the sixth to Converse Operations in the fundamental rules, and in the reductions of Compound Numbers and Fractions; the seventh to the five general cases of Percentage, and their special applications to Insurance Commission, Profit and Loss, Stocks, Taxes, Interest, and Discount; and the eighth to Miscellaneous Review Problems.

The First Course in Integers is designed especially for children who have had no previous instruction in Mental Arithmetic. Beginning at the Second Course in Integers, page 57, the order of subjects is the same as that in the Common School

Arithmetic; and, from this place to the end of the book, the two works can be used together, the same subject in the two books being studied at the same time. This arrangement has received the approval of many of the best teachers in the land.

**Drills on Combinations.**—The Addition, Subtraction, Multiplication, and Division tables are omitted. Thorough drills in the exercises given on pages 15, 17 to 22, 27, 30 to 35, 41, 51, and 52 will make pupils accurate and rapid in every possible combination of numbers.

**Problems.**—These are all new, and being prepared from material gathered from the various departments of actual business life, are, in numerous instances, the medium of instruction in the usages of business, and the uses of business terms and expressions.

**Illustrations.**—The cuts and diagrams, all of which were designed and engraved especially for this work, possess the superior artistic merit which has been conceded to the illustrations in the other works of this Series.

**Manual.**—A manual occupies the last ten pages of the work. The first three pages of this Manual contain hints and suggestions to teachers, references to which are made in the body of the work; and the last seven pages present methods of solving the different classes of problems found in the book, and are embraced together under the head

**Methods.**—All methods for the solution of problems being omitted from the body of the work, are here placed together, and are referred to after the problems to which they apply. These Methods are intended as models, to be varied at the discretion of the teacher. They are logical and progressive, while they avoid all useless verbiage and repetition.

The arrangement of the subjects, the manner in which they are presented, and the methods for the solution of problems,

have constant reference to the healthful development of the mental powers of the learner, conducting him, in an uninterrupted progress, from the easy to the difficult; presenting to him but one new difficulty at once, and giving him enough practice to enable him to master that difficulty before leaving it.

It is confidently believed that the abundant practice in combinations, in connection with the solution of the great number of easy problems given in the First Course in Integers, can not fail to make children accurate in combinations of numbers; while the very large number of well graded problems in the work, covering a wide range in the practical affairs of life, will afford the practice and discipline that will enable them to compute rapidly, and reason logically and concisely.

# CHAPTER I.

## FIRST COURSE IN INTEGERS.

### SECTION I.

#### *DEFINITIONS AND NOTATION.*

A *Unit* is a single thing, or one, of any kind; as, one apple, one bushel, one dozen.

A *Number* is a unit, or a collection of units.

A *Concrete Number* is a number applied to some object; as, four men, ten gallons, fifty quires.

An *Abstract Number* is a number not applied to any object; as, four, ten, fifty.

An *Integer* is a number the units of which are whole or undivided. Integers are also called *Whole Numbers*.

The use of numbers in estimating quantities and values in the practical affairs of life, is the *Art of Computation;* and a proper classification and arrangement of the definitions, principles, and rules used in computations, is the *Science of Numbers*. Hence,

*Arithmetic* is the science of numbers, and the art of computation.

In writing numbers for computations, ten characters, called *Figures,* are used.

The figure 0, called *cipher* or *naught*, denotes nothing, or the absence of number. The other figures represent the first nine integers, and are sometimes called *digits*.

The ten figures are

0, 1, 2, 3, 4, 5, 6, 7, 8, 9,

called *naught, one, two, three, four, five, six, seven, eight, nine.*

To express numbers greater than 9, two or more of the ten figures must be combined.

Every ten *ones* taken together are called a *ten.*

| | | |
|---|---|---|
| Ten | is written | *10* |
| 2 tens, or twenty, | are written | *20* |
| 3 tens, or thirty, | " | *30* |
| 4 tens, or forty, | " | *40* |
| 5 tens, or fifty, | " | *50* |
| 6 tens, or sixty, | " | *60* |
| 7 tens, or seventy, | " | *70* |
| 8 tens, or eighty, | " | *80* |
| 9 tens, or ninety, | " | *90* |

When two figures are written together to express a number, the left-hand figure expresses *tens*, and the right-hand figure *ones*. Thus,

| | | | | | | |
|---|---|---|---|---|---|---|
| Fourteen | consists of | 1 ten | and | 4 ones, | written | *14* |
| Twenty-three | " | 2 tens | " | 3 ones, | " | *23* |
| Thirty-six | " | 3 tens | " | 6 ones, | " | *36* |
| Forty-five | " | 4 tens | " | 5 ones, | " | *45* |
| Fifty-nine | " | 5 tens | " | 9 ones, | " | *59* |
| Sixty-seven | " | 6 tens | " | 7 ones, | " | *67* |
| Seventy-eight | " | 7 tens | " | 8 ones, | " | *78* |
| Eighty-one | " | 8 tens | " | 1 one, | " | *81* |
| Ninety | " | 9 tens | " | 0 ones, | " | *90* |

1. Write in words the following numbers: 23, 45, 66, 89, 91, 17, 40.
2. Write in words 61, 59, 7, 14, 75, 37, 98.
3. How many are expressed by each of the following numbers: 63, 72, 9, 56, 43, 25, 10, 82?
4. Write in words 73, 55, 18, 85, 32, 90, 27, 20.
5. Express by figures the following numbers: thirty, eleven, twenty-six, fifty-five.

6. Express by figures eighty-seven, thirty-four, nineteen, seventy-two.

7. Express by figures forty-one, eight, sixty-four, ninety-nine.

Every 10 tens taken together are called a *hundred.*

| | | |
|---|---|---|
| 10 tens are one hundred, | written | *100* |
| 20 tens are two hundred, | " | *200* |
| 30 tens are three hundred, | " | *300* |
| 40 tens are four hundred, | " | *400* |
| 50 tens are five hundred, | " | *500* |
| 60 tens are six hundred, | " | *600* |
| 70 tens are seven hundred, | " | *700* |
| 80 tens are eight hundred, | " | *800* |
| 90 tens are nine hundred, | " | *900* |

When three figures are written together to express a number, the left-hand figure expresses *hundreds*, the middle figure *tens*, and the right-hand figure *ones*. Thus,

| | | | | | |
|---|---|---|---|---|---|
| 172 is one hundred seventy-two, | or 1 hundred | 7 tens | and | 2 ones. |
| 863 " eight hundred sixty-three, | " 8 hundreds | 6 tens | " | 3 ones. |
| 351 " three hundred fifty-one, | " 3 hundreds | 5 tens | " | 1 one. |
| 408 " four hundred eight, | " 4 hundreds | 0 tens | " | 8 ones. |
| 519 " five hundred nineteen, | " 5 hundreds | 1 ten | " | 9 ones. |

8. Write in words the following numbers: 100, 700, 520, 960, 340, 210, 470. (See Manual, page 171.)

9. Write in words 444, 591, 716, 343, 434, 268.

10. How many are expressed by each of the following numbers: 254, 309, 207, 702, 506, 104, 999?

11. Express by figures the following numbers: two hundred, seven hundred sixty, three hundred seventeen, four hundred fifty-nine.

12. Express by figures three hundred seventy-four, one hundred eight, five hundred two, three hundred seven, seven hundred three, three hundred seventy, seven hundred thirty, nine hundred ninety-nine.

In writing numbers, every 10 hundreds taken together are called a *thousand*. Thousands are written thus:

| | | | |
|---|---|---|---|
| One thousand, | *1,000* | Five thousand, | *5,000* |
| Two thousand, | *2,000* | Six thousand, | *6,000* |
| Three thousand, | *3,000* | Seven thousand, | *7,000* |
| Four thousand, | *4,000* | Eight thousand, | *8,000* |

Nine thousand, *9,000*.

When four figures are written together to express a number, the left-hand figure expresses *thousands*, and the other three figures express *hundreds*, *tens*, and *ones*. Thus,

8,000 is eight thousand,
5,400 is five thousand four hundred,
2,560 is two thousand five hundred sixty,
1,644 is one thousand six hundred forty-four,
3,729 is three thousand seven hundred twenty-nine,
6,942 is six thousand nine hundred forty-two,
3,405 is three thousand four hundred five,
4,096 is four thousand ninety-six,
7,010 is seven thousand ten,
6,009 is six thousand nine.

*13.* Write in words the following numbers: 4,000; 6,200; 2,500; 5,100; 2,460; 4,620; 5,910.

*14.* Write in words 8,123; 3,434; 7,090; 1,050.

*15.* Write in words 3,091; 4,082; 2,075; 6,204; 3,708; 4,070; 9,030; 9,999.

*16.* Express by figures six thousand, five thousand three hundred, two thousand one hundred thirty, eight thousand three hundred twenty-five.

*17.* Express by figures four thousand fifty, seven thousand two, nine thousand sixty-eight, three thousand two hundred seven.

## SECTION II.

### *ADDITION.*

#### 1. From 1 and 1 to 10 and 10.

(See Manual, page 171.)

1. In this picture of a picnic party, is a group of boys, 3 of whom are standing, and 2 are sitting. How many boys are in the group? *Methods, page 174.*
2. How many trees are 1 tree and 2 trees? *Methods, page 174.*
3. 1 girl and 1 girl are how many girls?
4. One boy and four boys are how many boys?
5. How many men are 4 men and 2 men?
6. How many children are 6 children and 2 children?
7. Jane bought two peaches for 5 cents, and some peanuts for 1 cent. How many cents did she pay out?

8. Alice bought a pear for 1 cent, and a bunch of grapes for 7 cents. How many cents did she expend?

9. 2 balls and 7 balls are how many balls?

10. 9 girls and 1 boy are in the same class. How many pupils are in the class?

11. William's father gave him 8 marbles, and he found 1. How many marbles had he then?

12. Robert paid 10 cents for a slate, and 1 cent for a pencil. How many cents did his slate and pencil cost him?

13. How many books are 9 books and 2 books?

14. Ellen has 3 picture-books, and 5 books without pictures. How many books has she?

15. Charles paid 4 cents for an orange, and 3 cents for a lemon. How much did he pay for both?

16. Three roses are on one bush, and six on another. How many roses are there on both bushes?

17. Richard has 3 rabbits, and Thomas has 3. How many rabbits have the two boys?

18. Martha's muff cost 3 dollars, and her fur cape 7 dollars. How much did both of them cost?

19. In a pasture are 8 white sheep, and 3 black ones. How many sheep are in the pasture?

20. If you pay 3 cents for figs, and 9 cents for raisins, how many cents do you pay out?

21. Hiram found 5 eggs in one nest, and 4 in another. How many eggs did he find?

22. A hunter shot ten pigeons, and two quails. How many birds did he shoot? *Methods, page 174.*

23. Flora had 4 shells, and her brother gave her 4 more. How many shells had she then?

24. If a ball costs 6 cents, and a top 4 cents, how much do both cost?

25. A chandler sold 4 boxes of candles to one grocer, and 7 boxes to another. How many boxes did he sell to both?

26. Sarah is 9 years old, and her brother Joseph is 4 years older. How old is Joseph?

27. Fanny's silk dress cost 10 dollars, and her bonnet 4 dollars. How much did both cost?

28. A hotel keeper buys 4 loaves of brown bread, and 8 loaves of white bread, every day. How many loaves of bread does he buy daily?

How many are

29. 5 lilies and 5 lilies?
30. 4 cherries and 5 cherries?
31. 5 cherries and 4 cherries?
32. 6 pears and 5 pears?
33. 5 pears and 6 pears?
34. 5 days and 7 days?
35. 7 days and 5 days?
36. 10 minutes and 5 minutes?
37. 5 weeks and 9 weeks?
38. 9 weeks and 5 weeks?

In each of the preceding problems we have united or put together two numbers to form one larger number.

*Addition* is the process of uniting two or more numbers to form one number.

The *Amount* or *Sum* is the result obtained by Addition.

The *Parts* are the numbers which are united to form the sum.

The *Sign of Addition,* made thus, +, is called *Plus;* and when written between numbers, it signifies that they are to be added.

The *Sign of Equality,* made thus, =, when written between numbers or sets of numbers, signifies that they are equal to each other. Thus, 5 + 3 + 9 = 17 is read, "5 plus 3 plus 9 equals 17," or "the sum of 5, 3, and 9 is 17."

A number with the sign $ before it expresses dollars. Thus, $72 is read "72 dollars."

39. How many sheep are 7 sheep + 3 sheep?

40. 5 cows + 7 cows are how many cows?

41. 4 horses + 7 horses = how many horses?

42. What is the sum of $7 + $7? Of $7 + $9?

43. 8 robins + 7 robins = how many robins?

44. How many wrens are 7 wrens + 10 wrens?

45. An upholsterer made the seats for 6 mahogany chairs, and 6 rosewood chairs. How many chair seats did he make?

46. A dairy-man bought 7 large milk-pans, and 6 small ones. How many milk-pans did he buy?

47. Mary has 9 pinks, and Clara has 6. How many pinks have the two girls?

48. A grocer sold 5 bushels of sweet apples, and 8 bushels of sour ones. How many bushels of both kinds did he sell?

49. How many quarts of milk will it take to fill a 6-quart pan and an 8-quart pail?

50. A jeweler sold a bracelet for $7, and a locket for $7. How much did he receive for both?

51. If it takes 7 yards for a dress for Josephine, and 8 yards for one for Esther, how many yards will it take for the two dresses?

52. One week a milliner made 10 bonnets, and the next week 7. How many bonnets did she make in the two weeks?

53. I sold nine plows one day, and seven the next. How many plows did I sell in the two days?

54. A boy gathered 8 bushels of apples in the forenoon, and 8 bushels in the afternoon. How many bushels did he gather in all day?

55. If you go 8 miles east, and I go 9 miles west from this school-house, how far apart will we be?

56. A horse-dealer bought 9 black horses, and 9 bay ones. How many horses did he buy?

57. A book-keeper wrote 9 pages of entries in the forenoon, and 10 pages in the afternoon. How many pages did he write in the day?

58. I paid an agent $10 for insuring my dwelling-house, and $10 for insuring my furniture. How much did my insurance cost me?

59. Add 1 to 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10, in this manner: 1 and 1 are 2, 2 and 1 are 3, 3 and 1 are 4, and so on.

(See Manual, page 171.)

60. Add 2 to 1, 2, 3, 4, and so on to 10 inclusive.

61. Add 3 to 1, 2, 3, 4, and so on to 10 inclusive.

62. Add 4 to each number from 1 to 10 inclusive.

63. Add 5 to each number from 1 to 10 inclusive.

64. In the same manner, add 6 to 1, 2, 3, 4, and so on to 10 inclusive.

65. In the same manner, add 7 to 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

66. Add 8 to 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

67. Add 9 to 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

68. Add 10 to each number from 1 to 10 inclusive.

## 2. Addition, from 1 and 11 to 10 and 99.

69. A blacksmith shod 13 horses one day, and 4 horses the next. How many horses did he shoe in the two days?

70. The third day he shod 5 horses. How many horses did he shoe in the three days?

71. Alfred bought a knife for 45 cents, and sold it so as to gain 5 cents. How much did he get for it?

72. Twenty-five children were in their seats when school opened in the morning, and three afterward came in. How many children were in school that day?

73. What is the sum of $61 and $5?

74. My father is 38 years old. How old will he be in 7 years?

75. A paper-hanger used 8 rolls of paper for a bedroom, and 21 rolls for a parlor. How many rolls of paper did he use for the two rooms?

76. If I pay $24 for a coat, and $6 for a hat, how much do I pay for both?

77. A milk-man who had 18 cows, bought 5 more. How many cows had he then?

78. A boy tied a string 10 yards long to a kite string 72 yards long. How long was the whole?

79. Two fishermen caught 43 shad and 7 pickerel at one haul of a seine. How many fish did they catch?

80. Add 4 and 87. Add 5 and 69.

81. What is the sum of 6 and 39? Of 7 and 84?

82. Herman's grandfather was 73 years old 8 years ago. How old is he now?

83. On a ferry-boat were 46 gentlemen and 10 ladies. How many passengers were on board?

84. The crew of the boat consisted of 8 men. How many persons were on board?

85. A farmer paid $54 for a grain drill, and $9 for a plow. How much did he pay for both?

86. A laborer who had $50 in the savings-bank, deposited $8 more. How much money had he then on deposit?

87. There were 96 logs in the river near a saw-mill, and 7 on the river bank. How many logs were there in all?

88. A lady bought 9 yards of hall carpeting, and 37 yards of parlor carpeting. How many yards of carpeting did she buy?

89. One forenoon I traveled 69 miles by railroad, and 7 miles by stage. How far did I travel that forenoon?

90. In the afternoon I walked 6 miles. How far did I travel that day?

91. A farmer has 98 acres of cleared land, and 8 acres of woodland. How many acres are there in his farm?

92. 83 + 9 = how many? 9 + 37 = how many?

### 3. Addition by Decades, or Skips of Ten.

*1.*

93. Add 1 to 10, 20, 30, 40, 50, 60, 70, 80, and 90.

(See Manual, page 171.)

94. What is the sum of 11 and 1? 21 and 1? 31 and 1? 41 and 1? 51 and 1? 61 and 1? 71 and 1? 81 and 1? 91 and 1?

95. What is the sum of 12 and 1? 22 and 1? 32 and 1? 42 and 1? 52 and 1? 62 and 1? 72 and 1? 82 and 1? 92 and 1?

96. How many are 13 and 1? 23 and 1? 33 and 1? 43 and 1? 53 and 1? 63 and 1? 73 and 1? 83 and 1? 93 and 1?

97. How many are 14 and 1? 24 and 1? 34 and 1? 44 and 1? 54 and 1? 64 and 1? 74 and 1? 84 and 1? 94 and 1?

98. How many are 15 and 1? 25 and 1? 35 and 1? 45 and 1? 55 and 1? 65 and 1? 75 and 1? 85 and 1? 95 and 1?

99. Add 1 to 16, 26, 36, 46, 56, 66, 76, 86, and 96.

100. Add 1 to 17, 27, 37, 47, 57, 67, 77, 87, and 97.

101. Add 1 to 18, 28, 38, 48, 58, 68, 78, 88, and 98.

102. What is the sum of 19 and 1? 29 and 1? 39 and 1? 49 and 1? 59 and 1? 69 and 1? 79 and 1? 89 and 1? 99 and 1?

## 2.

103. Add 2 to 10, 20, 30, 40, 50, 60, 70, 80, and 90.

104. Add 2 to every tenth number from 11 to 91 inclusive.

105. Add 2 to 12, 22, 32, and so on to 92 inclusive.

106. How many are 13 and 2? 23 and 2? 33 and 2? 43 and 2? 53 and 2? 63 and 2? 73 and 2? 83 and 2? 93 and 2?

107. How many are 14 and 2? 24 and 2? 34 and 2? 44 and 2? 54 and 2? 64 and 2? 74 and 2? 84 and 2? 94 and 2?

108. How many are 15 and 2? 25 and 2? 35 and 2? 45 and 2? 55 and 2? 65 and 2? 75 and 2? 85 and 2? 95 and 2?

109. Add 2 to 16, 26, 36, 46, 56, 66, 76, 86, and 96.

110. Add 2 to 17, 27, 37, 47, 57, 67, 77, 87, and 97.

111. Add 2 to 18, 28, 38, 48, 58, 68, 78, 88, and 98.

112. What is the sum of 19 and 2? 29 and 2? 39 and 2? 49 and 2? 59 and 2? 69 and 2? 79 and 2? 89 and 2? 99 and 2?

## 3.

113. Add 3 to every tenth number from 10 to 90 inclusive.

114. Add 3 to every tenth number from 11 to 91 inclusive.

115. Add 3 to 12, 22, 32, and so on to 92 inclusive.

116. Add 3 to 13, 23, 33, 43, 53, 63, 73, 83, and 93.

117. Add 3 to 14, 24, 34, 44, 54, 64, 74, 84, and 94.

118. Add 3 to 15, 25, 35, 45, 55, 65, 75, 85, and 95.

119. Add 3 to 16, 26, 36, 46, 56, 66, 76, 86, and 96.

120. Add 3 to 17, 27, 37, 47, 57, 67, 77, 87, and 97.

121. Add 3 to 18, 28, 38, 48, 58, 68, 78, 88, and 98.

122. Add 3 to 19, 29, 39, 49, 59, 69, 79, 89, and 99.

## 4.

123. Add 4 to every tenth number from 10 to 90 inclusive.
124. Add 4 to every tenth number from 11 to 91 inclusive.
125. Add 4 to 12, 22, 32, and so on to 92 inclusive.
126. Add 4 to 13, 23, 33, 43, 53, 63, 73, 83, and 93.
127. Add 4 to 14, 24, 34, 44, 54, 64, 74, 84, and 94.
128. Add 4 to 15, 25, 35, 45, 55, 65, 75, 85, and 95.
129. Add 4 to 16, 26, 36, and so on to 96 inclusive.
130. Add 4 to every tenth number from 17 to 97 inclusive.
131. What is the sum of 18 and 4? 28 and 4? 38 and 4? 48 and 4? 58 and 4? 68 and 4? 78 and 4? 88 and 4? 98 and 4?
132. Add 4 to 19, 29, 39, 49, 59, 69, 79, 89, and 99.

## 5.

133. Add 5 to every tenth number from 10 to 90 inclusive.
134. Add 5 to 11, 21, 31, 41, 51, 61, 71, 81, and 91.
135. Add 5 to every tenth number from 12 to 92 inclusive.
136. Add 5 to every tenth number from 13 to 93 inclusive.
137. Add 5 to 14, 24, 34, and so on to 94 inclusive.
138. Add 5 to 15, 25 35, and so on to 95 inclusive.
139. Add 5 to 16, 26, 36, and so on to 96 inclusive.
140. Add 5 to every tenth number from 17 to 97 inclusive.
141. What is the sum of 18 and 5? 28 and 5? 38 and 5? 48 and 5? 58 and 5? 68 and 5? 78 and 5? 88 and 5? 98 and 5?
142. Add 5 to 19, 29, 39, and so on to 99 inclusive.

## 6.

143. Add 6 to 10, 20, 30, and so on to 90 inclusive.
144. Add 6 to 11, 21, 31, and so on to 91 inclusive.
145. Add 6 to every tenth number from 12 to 92 inclusive.
146. Add 6 to every tenth number from 13 to 93 inclusive.
147. Add 6 to 14, 24, 34, and so on to 94 inclusive.

148. Add 6 to 15, 25, 35, and so on to 95 inclusive.

149. Add 6 to 16, 26, 36, and so on to 96 inclusive.

150. Add 6 to every tenth number from 17 to 97 inclusive.

151. What is the sum of 18 and 6? 28 and 6? 38 and 6? 48 and 6? 58 and 6? 68 and 6? 78 and 6? 88 and 6? 98 and 6?

152. Add 6 to 19, 29, 39, and so on to 99 inclusive.

## 7.

153. Add 7 to 10, 20, 30, and so on to 90 inclusive.

154. Add 7 to 11, 21, 31, and so on to 91 inclusive.

155. Add 7 to 12, 22, 32, 42, 52, 62, 72, 82, and 92.

156. Add 7 to every tenth number from 13 to 93 inclusive.

157. Add 7 to 14, 24, 34, and so on to 94 inclusive.

158. Add 7 to 15, 25, 35, and so on to 95 inclusive.

159. Add 7 to 16, 26, 36, and so on to 96 inclusive.

160. Add 7 to 17, 27, 37, and so on to 97 inclusive.

161. Add 7 to every tenth number from 18 to 98 inclusive.

162. How many are 19 and 7? 29 and 7? 39 and 7? 49 and 7? 59 and 7? 69 and 7? 79 and 7? 89 and 7? 99 and 7?

## 8.

163. Commencing at 10, add 8 to every tenth number to 90 inclusive.

164. Commence at 11, and add 8 to every tenth number to 91 inclusive.

165. Add 8 to 12, 22, 32, 42, 52, 62, 72, 82, and 92.

166. Add 8 to 13, 23, 33, and so on to 93 inclusive.

167. Add 8 to every tenth number from 14 to 94 inclusive.

168. Add 8 to every tenth number from 15 to 95 inclusive.

169. How many are 16 and 8? 26 and 8? 36 and 8? 46 and 8? 56 and 8? 66 and 8? 76 and 8? 86 and 8? 96 and 8?

170. Add 8 to 17, 27, 37, and so on to 97 inclusive.

171. Add 8 to every tenth number from 18 to 98 inclusive.

172. How many are 19 and 8? 29 and 8? 39 and 8? 49 and 8? 59 and 8? 69 and 8? 79 and 8? 89 and 8? 99 and 8?

## 9.

173. Add 9 to every tenth number from 10 to 90 inclusive.

174. Add 9 to 11, 21, 31, 41, 51, 61, 71, 81, and 91.

175. Commence at 12, and add 9 to every tenth number to 92 inclusive.

176. Add 9 to 13, 23, 33, and so on to 93 inclusive.

177. Add 9 to every tenth number from 14 to 94 inclusive.

178. Add 9 to every tenth number from 15 to 95 inclusive.

179. How many are 16 and 9? 26 and 9? 36 and 9? 46 and 9? 56 and 9? 66 and 9? 76 and 9? 86 and 9? 96 and 9?

180. Add 9 to 17, 27, 37, and so on to 97 inclusive.

181. Add 9 to every tenth number from 18 to 98 inclusive.

182. Add 9 to every tenth number from 19 to 99 inclusive.

## 10.

183. Add 10 to every tenth number from 10 to 90 inclusive.

184. Add 10 to 11, 21, 31, and so on to 91 inclusive.

185. Add 10 to 12, 22, 32, and so on to 92 inclusive.

186. Add 10 to 13, 23, 33, 43, 53, 63, 73, 83, and 93.

187. Add 10 to every tenth number from 14 to 94 inclusive.

188. Add 10 to every tenth number from 15 to 95 inclusive.

189. How many are 16 and 10? 26 and 10? 36 and 10? 46 and 10? 56 and 10? 66 and 10? 76 and 10? 86 and 10? 96 and 10?

190. Add 10 to 17, 27, 37, and so on to 97 inclusive.

191. Add 10 to every tenth number from 18 to 98 inclusive.

192. Add 10 to every tenth number from 19 to 99 inclusive.

(See Manual, page 171.)

## SECTION III.

### *SUBTRACTION.*

#### 4. From 1 minus 1 to 20 minus 10.

1. We can see 3 of the windows of this school-house; 1 of them is small, and the others are large. How many large windows can we see? *Methods, page 174.*
2. 1 tree from 2 trees leaves how many trees?
3. One of the four girls in the yard is sitting down, and the others are at play. How many are at play?
4. 2 boys from 2 boys leave how many boys?
5. In the street are 4 children at play, and 2 of them are boys. How many are girls? *Methods, page 174.*
6. 2 marbles from 3 marbles leave how many marbles?
7. 1 hoop from 1 hoop leaves how many hoops?
8. There are 5 school days in 1 week. If Julius is absent 2 days, how many days is he in school?
9. Florence brought 7 roses to school, and gave 5 of them to her teacher. How many had she left?

10. In a pasture were 9 horses, but 1 of them jumped out. How many remained in the pasture?

11. Otis had 7 doves, but 2 of them have died. How many has he now? *Methods, page 174.*

12. A girl bought some steel pens for 2 cents, and gave in payment a 10-cent piece. How many cents in change did she receive?

13. Eliza is 11 years old, and Hannah is 2 years younger. How old is Hannah?

14. A silversmith made 12 butter knives, and sold all but 2 of them. How many did he sell?

15. 4 boys were skating, but 3 of them went home. How many then remained on the ice?

16. A cabinet maker made 5 tables, and sold 3 of them. How many had he left?

17. On a pear tree were 8 pears, but Julia picked 3 of them. How many were left on the tree?

18. Seven carpenters commenced building a house, but five of them left. How many remained?

19. A man earns 10 dollars in a week, and his son earns 3 dollars. How much more does the father earn than the son?

20. If a dress-maker earns $12 in a week, and expends $3, how much does she save?

21. A farmer having 6 calves, sold 4 of them to a butcher. How many had he left?

22. Irene had 8 canary-birds, but 5 of them escaped. How many had she then?

23. A tinsmith made 13 pails, and sold 4 of them. How many remained unsold?

24. One morning 4 vessels were lying at a wharf, but during the day 4 of them sailed away. How many vessels were at the wharf at night?

25. No vessels from four vessels leave how many vessels?

26. A basket maker made 9 baskets, 4 of them of splints, and the others of willow. How many willow baskets did he make?

27. I paid a silversmith $11 for a cake basket, and $4 less for a set of tea-spoons. How much did the spoons cost me?

In each of the preceding problems we have taken one of two numbers from another to find the difference.

*Subtraction* is the process of taking one of two numbers from the other.

The *Remainder* or *Difference* is the result obtained by subtraction.

The *Minuend* is that one of two numbers from which the other is to be taken.

The *Subtrahend* is that one of two numbers which is to be taken from the other.

The *Sign of Subtraction*, made thus, —, is called *Minus;* and when written between two numbers, it signifies that the number after it is to be subtracted from the number before it. Thus, 15 — 6 is read, "15 minus 6," and signifies that 6 is to be subtracted from 15.

28. How many are 10 sheep — 3 sheep?

29. 12 cows — 5 cows = how many cows?

30. What is the difference between 11 horses and 4 horses?

31. The minuend is 9 and the subtrahend is 4. What is the remainder?

32. A wood dealer sold 6 cords of wood, from a pile of 7 cords. How many cords were left in the pile?

33. A boy sold a water-melon for 8 cents, and a bunch of grapes for 6 cents. How much more did he get for the melon than for the grapes?

34. A man bought 9 pounds of butter, and his family used 6 pounds of it in a week. How many pounds were left?

35. There are 6 passengers in a stage-coach, which has seats for 15 passengers. How many vacant seats are there in the coach?

36. A soldier's monthly pay is $13. If he spends $6, how much does he save?

37. Of the 16 schools in a certain town, 6 are taught by gentlemen. How many are taught by ladies?

38. One Saturday 7 boys and 7 girls were skating. How many more boys than girls were there?

39. James has 9 rabbits; 7 of them are gray, and the others are white. How many white rabbits has he?

40. In traveling 12 miles, I rode 7 miles, and walked the remainder of the distance. How many miles did I walk?

41. The minuend is 14, and the subtrahend is 7. What is the difference?

42. A merchant has two clerks. To the older one he pays $16 a month, and to the younger one $7 less. How much are the monthly wages of the younger clerk?

43. A farmer having 15 cows, sold 7 of them. How many did he keep?

44. Of the 17 cars of a freight train, 7 are empty. How many are loaded?

45. Of the loaded cars 7 contain grain, and the others flour. How many cars contain flour?

46. 7 and how many are 11? *Methods, page 174.*

47. Nelson is 12 years old. How old was he 4 years ago?

48. Andrew has caught 8 trout, and Louis 8. Which has caught the greater number?

49. How many more must Andrew catch to have 11? How many more to have 15?

50. Which is the greater, 13 — 8 or 14 — 9?

51. A gunsmith made 10 rifles, and sold 8 of them. How many remained unsold?

52. 8 and how many are 16?

53. A gardener carried 17 bushels of green peas to the city. He sold 8 bushels on First Street, and the remainder on Second Street. How many bushels did he sell on Second Street?

54. 8 and how many are 18? 10 and how many are 18?

55. How many are 18 less 9? 17 less 10?

56. Take 18 minus 10 from 18 minus 8.

57. Nine feet of the length of a barber's pole are above the ground, and the pole is 15 feet long. How much of the pole is in the ground?

58. One day a newsboy sold 19 morning papers, and 10 evening papers. How many more morning than evening papers did he sell?

59. A blacksmith bought 10 tons of coal, and he has used 9 tons of it. How much coal has he left?

60. Seven dollars have been paid on a note for nineteen dollars. How much remains due?

61. How old were you 5 years ago?

62. A farmer paid $16 for a corn-planter, and after using it two seasons, sold it for $9. How much did the use of it cost him?

63. 13 boys entered school at the beginning of the winter term, and 8 of them continued in school all the term. How many left school before the term closed?

64. A potter made 17 two-gallon jugs, and 9 one-gallon jugs. Of which kind did he make the greater number, and how many?

65. Subtract 1 from 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11, in this manner: 1 from 1 leaves 0, 1 from 2 leaves 1, 1 from 3 leaves 2, 1 from 4 leaves 3, and so on. (See Manual, page 172.)

66. Subtract 2 from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12.

67. Subtract 3 from 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13.

68. Subtract 4 from 4, 5, 6, 7, and so on to 14 inclusive.

69. Take 5 from 5, 6, 7, 8, and so on to 15 inclusive.

70. Take 6 from 6, 7, 8, 9, and so on to 16 inclusive.

71. How many are 7 minus 7? 8 minus 7? 9 minus 7? 10 minus 7? 11 minus 7? 12 minus 7? 13 minus 7? 14 minus 7? 15 minus 7? 16 minus 7? 17 minus 7?

72. How many are 8 minus 8? 9 minus 8? 10 minus 8? 11 minus 8? 12 minus 8? 13 minus 8? 14 minus 8? 15 minus 8? 16 minus 8? 17 minus 8? 18 minus 8?

73. What is the remainder, after taking 9 from 9? 9 from 10? 9 from 11? 9 from 12? 9 from 13? 9 from 14? 9 from 15? 9 from 16? 9 from 17? 9 from 18? 9 from 19?

74. How many are 10 — 10? 11 — 10? 12 — 10? 13 — 10? 14 — 10? 15 — 10? 16 — 10? 17 — 10? 18 — 10? 19 — 10? 20 — 10?

### 5. Subtraction, from 20 minus 1 to 110 minus 10.

75. Homer having 26 rabbits, sold 5 of them. How many had he left?

76. A farmer had 87 sheep, but 3 of them were killed by dogs. How many sheep had he left?

77. A man bought a watch for $59, and sold it for $9 less than cost. How much did he get for it?

78. From a farm of 89 acres, the owner sold 7 acres. How many acres had he then?

79. There were 20 roses on a bush, and Emily picked 8 of them. How many were left on the bush?

80. A market woman took 36 geese to market, and sold all but 7 of them. How many did she sell?

81. A stove dealer sold a stove for $23, and his profit was $4. How much did the stove cost him?

82. If I gain $6 by selling a lumber wagon for $91, how much did it cost me?

83. Grace is 9 years old, and her father is 45. What is the difference in their ages?

84. From a pile containing 24 cords of wood, a teamster drew 6 cords. How much wood was left in the pile?

85. A piece of cloth 60 yards long, shrank 2 yards in fulling. What was its length then?

86. A man having $36, paid $8 for a silk hat. How much money had he left?

87. From a cask containing 33 gallons of oil, 6 gallons were drawn. How much oil was left in the cask?

88. Of 43 guests who dined at a hotel, 9 were ladies. How many were gentlemen?

89. I have $40. If I pay $5 that I owe, what sum shall I have left?

90. What is the difference between 31 and 8?

91. The minuend is 42, and the subtrahend is 7. What is the difference?

92. Which is the greater, 54 — 9 or 49 — 6? *Methods, p. 174.*

93. A cooper made 100 barrels, and 5 of them were condemned as bad. How many were good?

94. Of the good ones, 7 were pork barrels, and the remainder were flour barrels. How many were flour barrels?

95. After selling 8 flour barrels, how many had he left?

96. From a chest containing 82 pounds of tea, a grocer sold 5 pounds. How much tea was left in the chest?

97. From a coil of rope 76 feet long, a piece 9 feet long was cut. What was the length of the remainder of the coil?

98. Which is the greater, 102 — 9 or 100 — 7?

99. The distance from A to B is 105 miles by canal, and 8 miles less by railroad. What is the distance by railroad?

100. A crockery dealer, on opening a case containing 108 fruit cans, found 9 of them broken. How many were whole?

101. After selling 8 of the perfect cans, how many had he left?

102. Harry having 78 cents, spent 9 cents for firecrackers. How much money had he then?

## 6. Subtraction by Decades, or Skips of Ten.

### 1.

*103.* Subtract 1 from 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100.

(See Manual, page 172.)

*104.* What is the remainder, after taking 1 from 11? 1 from 21? 1 from 31? 1 from 41? 1 from 51? 1 from 61? 1 from 71? 1 from 81? 1 from 91?

*105.* What is the remainder, after taking 1 from 12? 1 from 22? 1 from 32? 1 from 42? 1 from 52? 1 from 62? 1 from 72? 1 from 82? 1 from 92?

*106.* Subtract 1 from 13, 23, 33, and so on to 93 inclusive.

*107.* Subtract 1 from 14, 24, 34, and so on to 94 inclusive.

*108.* Subtract 1 from 15, 25, 35, and so on to 95 inclusive.

*109.* Subtract 1 from 16, 26, 36, 46, 56, 66, 76, 86, and 96.

*110.* Subtract 1 from 17, 27, 37, 47, 57, 67, 77, 87, and 97.

*111.* Subtract 1 from 18, 28, 38, 48, 58, 68, 78, 88, and 98.

*112.* Subtract 1 from 19, 29, 39, and so on to 99 inclusive.

### 2.

*113.* Subtract 2 from 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100.

*114.* Subtract 2 from every tenth number from 11 to 101 inclusive.

*115.* Subtract 2 from 12, 22, 32, and so on to 92 inclusive.

*116.* What is the remainder, after taking 2 from 13? 2 from 23? 2 from 33? 2 from 43? 2 from 53? 2 from 63? 2 from 73? 2 from 83? 2 from 93?

*117.* Take 2 from 14, 24, 34, and so on to 94 inclusive.

*118.* Take 2 from 15, 25, 35, and so on to 95 inclusive.

*119.* Subtract 2 from 16, 26, 36, 46, 56, 66, 76, 86, and 96.

*120.* Subtract 2 from 17, 27, 37, 47, 57, 67, 77, 87, and 97.

*121.* Subtract 2 from 18, 28, 38, 48, 58, 68, 78, 88, and 98.

*122.* What is the remainder, after taking 2 from 19? 2 from 29? 2 from 39? 2 from 49? 2 from 59? 2 from 69? 2 from 79? 2 from 89? 2 from 99?

### 3.

123. Subtract 3 from every tenth number from 10 to 100 inclusive.

124. Subtract 3 from every tenth number from 11 to 101 inclusive.

125. Subtract 3 from 12, 22, 32, and so on to 102 inclusive.

126. Subtract 3 from 13, 23, 33, 43, 53, 63, 73, 83, and 93.

127. Subtract 3 from 14, 24, 34, 44, 54, 64, 74, 84, and 94.

128. Subtract 3 from 15, 25, 35, 45, 55, 65, 75, 85, and 95.

129. Subtract 3 from 16, 26, 36, 46, 56, 66, 76, 86, and 96.

130. Subtract 3 from 17, 27, 37, 47, 57, 67, 77, 87, and 97.

131. Subtract 3 from 18, 28, 38, 48, 58, 68, 78, 88, and 98.

132. Subtract 3 from 19, 29, 39, 49, 59, 69, 79, 89, and 99.

### 4.

133. Subtract 4 from every tenth number from 10 to 100 inclusive.

134. Subtract 4 from every tenth number from 11 to 101 inclusive.

135. Subtract 4 from 12, 22, 32, and so on to 102 inclusive.

136. Subtract 4 from 13, 23, 33, 43, 53, 63, 73, 83, 93, and 103.

137. Subtract 4 from 14, 24, 34, 44, 54, 64, 74, 84, and 94.

138. Subtract 4 from 15, 25, 35, 45, 55, 65, 75, 85, and 95.

139. Subtract 4 from 16, 26, 36, and so on to 96 inclusive.

140. Subtract 4 from every tenth number from 17 to 67 inclusive.

141. What is the remainder, after taking 4 from 18? 4 from 28? 4 from 38? 4 from 48? 4 from 58? 4 from 68? 4 from 78? 4 from 88? 4 from 98?

142. Subtract 4 from 19, 29, 39, 49, 59, 69, 79, 89, and 99.

### 5.

143. Subtract 5 from 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100.

144. Subtract 5 from 11, 21, 31, 41, 51, 61, 71, 81, 91, and 101.

145. Subtract 5 from every tenth number from 12 to 102 inclusive.

*146.* Subtract 5 from every tenth number from 13 to 103 inclusive.

*147.* Subtract 5 from 14, 24, 34, 44, 54, 64, 74, 84, 94, and 104.

*148.* Subtract 5 from 15, 25, 35, and so on to 95 inclusive.

*149.* Subtract 5 from 16, 26, 36, and so on to 96 inclusive.

*150.* Subtract 5 from every tenth number from 17 to 97 inclusive.

*151.* What is the remainder, after taking 5 from 18? 5 from 28? 5 from 38? 5 from 48? 5 from 58? 5 from 68? 5 from 78? 5 from 88? 5 from 98?

*152.* Subtract 5 from 19, 29, 39, and so on to 99 inclusive.

## *6.*

*153.* Subtract 6 from 10, 20, 30, and so on to 100 inclusive.

*154.* Subtract 6 from 11, 21, 31, 41, and so on to 101 inclusive.

*155.* Subtract 6 from every tenth number from 12 to 102 inclusive.

*156.* Subtract 6 from every tenth number from 13 to 103 inclusive.

*157.* Subtract 6 from 14, 24, 34, and so on to 104 inclusive.

*158.* Subtract 6 from 15, 25, 35, and so on to 105 inclusive.

*159.* Subtract 6 from 16, 26, 36, and so on to 96 inclusive.

*160.* Subtract 6 from every tenth number from 17 to 97 inclusive.

*161.* What is the remainder, after taking 6 from 18? 6 from 28? 6 from 38? 6 from 48? 6 from 58? 6 from 68? 6 from 78? 6 from 88? 6 from 98?

*162.* Subtract 6 from 19, 29, 39, and so on to 99 inclusive.

## *7.*

*163.* Subtract 7 from 10, 20, 30, and so on to 100 inclusive.

*164.* Subtract 7 from 11, 21, 31, 41, and so on to 101 inclusive.

*165.* Subtract 7 from 12, 22, 32, 42, 52, 62, 72, 82, 92, and 102.

*166.* Subtract 7 from every tenth number from 13 to 103 inclusive.

*167.* Subtract 7 from 14, 24, 34, and so on to 104 inclusive.

*168.* Subtract 7 from 15, 25, 35, and so on to 105 inclusive.

*169.* Subtract 7 from 16, 26, 36, and so on to 106 inclusive.

*170.* Subtract 7 from 17, 27, 37, and so on to 97 inclusive.

*171.* Subtract 7 from every tenth number from 18 to 98 inclusive.

*172.* What is the remainder, after taking 7 from 19? 7 from 29? 7 from 39? 7 from 49? 7 from 59? 7 from 69? 7 from 79? 7 from 89? 7 from 99?

## *8.*

*173.* Commencing at 10, subtract 8 from every tenth number to 100 inclusive.

*174.* Commence at 11, and subtract 8 from every tenth number to 101 inclusive.

*175.* Subtract 8 from 12, 22, 32, 42, 52, 62, 72, 82, 92, and 102.

*176.* Subtract 8 from 13, 23, 33, and so on to 103 inclusive.

*177.* Subtract 8 from every tenth number from 14 to 104 inclusive.

*178.* Subtract 8 from every tenth number from 15 to 105 inclusive.

*179.* What is the remainder, after taking 8 from 16? 8 from 26? 8 from 36? 8 from 46? 8 from 56? 8 from 66? 8 from 76? 8 from 86? 8 from 96? 8 from 106?

*180.* Subtract 8 from 17, 27, 37, and so on to 107 inclusive.

*181.* Subtract 8 from every tenth number from 18 to 98 inclusive.

*182.* Take 8 from 19, 29, 39, 49, 59, 69, 79, 89, and 99.

## *9.*

*183.* Subtract 9 from every tenth number from 10 to 100 inclusive.

*184.* Subtract 9 from 11, 21, 31, 41, 51, 61, 71, 81, 91, and 101.

*185.* Commence at 12, and subtract 9 from every tenth number to 102 inclusive.

*186.* Subtract 9 from 13, 23, 33, and so on to 103 inclusive.

*187.* Subtract 9 from every tenth number from 14 to 104 inclusive.

*188.* Subtract 9 from every tenth number from 15 to 105 inclusive.

*189.* What is the remainder, after taking 9 from 16? 9 from 26? 9 from 36? 9 from 46? 9 from 56? 9 from 66? 9 from 76? 9 from 86? 9 from 96? 9 from 106?

*190.* Subtract 9 from 17, 27, 37, and so on to 107 inclusive.

*191.* Subtract 9 from every tenth number from 18 to 108 inclusive.

*192.* Subtract 9 from every tenth number from 19 to 99 inclusive.

## *10.*

*193.* Subtract 10 from every tenth number from 10 to 100 inclusive.

*194.* Subtract 10 from 11, 21, 31, and so on to 101 inclusive.

*195.* Subtract 10 from 12, 22, 32, and so on to 102 inclusive.

*196.* Subtract 10 from 13, 23, 33, 43, 53, 63, 73, 83, 93, and 103.

*197.* Subtract 10 from every tenth number from 14 to 104 inclusive.

*198.* Subtract 10 from every tenth number from 15 to 105 inclusive.

*199.* What is the remainder, after taking 10 from 16? 10 from 26? 10 from 36? 10 from 46? 10 from 56? 10 from 66? 10 from 76? 10 from 86? 10 from 96? 10 from 106?

*200.* Subtract 10 from 17, 27, 37, and so on to 107 inclusive.

*201.* Subtract 10 from every tenth number from 18 to 108 inclusive.

*202.* Subtract 10 from every tenth number from 19 to 109 inclusive.

## SECTION IV.

### *REVIEW PROBLEMS.*

1. EDWARD gave 5 cents for a pencil, 4 cents for a cake of rubber, and 7 cents for drawing paper. How many cents did he expend? *Methods, page 174.*

2. A man husked 9 bushels of corn in the forenoon, 7 bushels in the afternoon, and 3 bushels in the evening. How much corn did he husk in all?

3. Albert has 6 apples, Frank has 8, and Edgar has 5. How many apples have the three boys?

4. In a certain school there are 5 pupils in the A class, 9 in the B class, 7 in the C class, and 8 in the D class. How many pupils are in the 4 classes?

5. A wood dealer has 26 cords of maple wood, 7 cords of hickory, 9 cords of beech, and 5 cords of hemlock. How much wood has he?

6. $37 + 8 + 9 =$ how many?

7. What is the sum of 66, 5, 6, and 9?

8. How many are $48 + 3 + 6 + 9 + 4$?

9. Reuben having 9 peaches, gave 5 to Ada, and 4 to Juliet. How many has he left? *Methods, page 174.*

10. If I have $17, and I spend $6 for pictures, and $8 for books, how much money shall I have left?

11. From a bin that contained 64 bushels of wheat, 10 bushels were taken at one time, and 3 at another. How much wheat remained in the bin?

12. A high rock on the sea-shore stands 7 feet in the water. If the tide rises 7 feet, and afterward falls 9 feet, how many feet of the rock will be under water? *Methods, page 175.*

13. A laborer earned $11 one week, $6 the next, and spent $8 in the two weeks. How much money had he left?

14. 39 + 8 − 5 = how many?

15. Eight less than eighty-eight, plus nine, are how many?

16. 56 − 8 − 8 are how many?

17. If I have 75 books, and give away 10 of them, and afterward buy 7 more, how many books shall I then have?

18. If I owe $54, $8, and $4, and I pay all but $10, how much do I pay?

19. How many more than 7 is the sum of 91, 5, and 10?

20. 34 − 9 − 6 − 7 = how many?

21. 87 + 8 + 8 − 9 − 5 are how many?

22. Victor having 17 doves, sold 6 to Walter, 5 to Alvan, and 4 to Luther. How many doves had he then?

23. Ralph had a 10-cent piece, and a 5-cent piece; but he has paid 8 cents of his money for a top, and 7 cents for marbles. How many cents has he left?

24. A silversmith melted together 25 ounces of silver, and 6 of copper. He used 4 ounces of the mixture for tea-spoons, 8 ounces for table-spoons, and the rest for forks. How much did he use for forks?

25. How old were you 7 years ago? How old will you be 7 years hence?

26. In 5 years Ira will be 14 years old. How old was he 6 years ago?

27. Levi has 9 pears in his hat, 10 in his pockets, and 3 in his hand. If he gives 7 pears to his brother, and 5 to his sister, how many pears will he have left?

## SECTION V.

### *MULTIPLICATION.*

#### 7. From 2 times 1 to 10 times 10.

1. In each of two wagons there is one barrel of flour. How many barrels in both wagons?
2. Two horses are called a span. How many horses are there in two spans?
3. There are 3 windows in one side of a mill, and 3 in one end. How many windows are in the side and end?
4. A wagon has 4 wheels. How many wheels have 2 wagons?
5. Each railing of a bridge has 5 posts. How many posts have the 2 railings?
6. A little girl bought 2 sticks of cream candy, 2 of lemon, and 2 of peppermint. How many sticks of candy did she buy?

7. There are 2 boys on one seat, 2 on another, 2 on another, and 2 on another. How many boys are on the 4 seats?

8. If you study 2 hours on Monday, 2 hours on Tuesday, 2 hours on Wednesday, 2 hours on Thursday, and 2 hours on Friday, how many hours will you study in the 5 days?

9. How many are 1 + 1, or 2 times 1?

10. How many are 2 + 2, or 2 times 2?

11. How many are 3 + 3, or 2 times 3?

12. How many are 4 + 4, or 2 times 4?

13. How many are 5 + 5, or 2 times 5?

14. How many are 2 + 2 + 2, or 3 times 2?

15. How many are 2 + 2 + 2 + 2, or 4 times 2?

16. How much will 2 barrels of flour cost, at $8 a barrel? *Methods, page 175.*

17. How many days in 2 weeks?

18. A cooper can make 10 barrels in 1 day. How many can he make in 2 days?

19. How much will 2 papers of ground pepper cost, at 9 cents a paper?

20. How much will 9 axes cost, at $2 apiece?

21. Two oxen are called a yoke. How many oxen are ten yoke of oxen?

22. How many cherries are there in 3 clusters of 3 cherries each?

23. How many cherries are there in 4 such clusters?

24. How many in 5 clusters?

25. How many roses are on 3 branches, there being 5 roses on each branch?

26. How many buds are on 3 stems of a rose-bush, if there are 4 buds on each stem?

27. How many leaves are on 3 branches, if there are 6 leaves on each branch?

28. A miller sold 6 barrels of corn meal, at $3 a barrel. How much did he receive for it?

29. If a cow gives 7 quarts of milk a day, how much will she give in 3 days?

30. How many eggs are 3 times 8 eggs? 8 times 3 eggs?

31. How many stars are 3 times 10 stars? 10 times 3 stars?

32. How many trees are 3 times 9 trees? 9 times 3 trees?

In each of the preceding problems we have found the sum of as many times one of the two given numbers as there are ones in the other given number.

*Multiplication* is a short process for finding the sum of as many times one of two numbers as there are ones in the other.

The *Product* is the result obtained by *Multiplication.*

The *Factors* are the numbers used to obtain the product.

The *Multiplicand* is that factor which is to be taken any certain number of times.

The *Multiplier* is that factor which shows how many times the multiplicand is to be taken.

The *Sign of Multiplication,* made thus, ×, when placed between two numbers, signifies that they are to be multiplied together. It is read "times," or "multiplied by." Thus, 4 × 9 is read "4 times 9," or "4 multiplied by 9."

33. The factors are 4 and 9. What is the product?

34. The multiplicand is 8, and the multiplier is 5. What is the product?

35. What is the product of 5 × 7 peaches? Of 6 × $3?

36. What is the product of 4 × 9? 9 × 4?

37. 2 × 7 = how many? 8 × 5 = how many?

38. How much will 4 primers cost, at 4 cents apiece?

39. How much will 5 pounds of chalk cost, at 4 cents a pound?

40. 6 spoons, forks, or knives are called a set. How many forks are there in 4 sets?

41. If 8 acres of grass can be cut with a mowing-machine in a day, how much can be cut in 4 days?

42. How much will 4 buffalo-robes cost, at $9 apiece?

43. If a forwarder loads 4 boats a day, how many will he load in 7 days?

44. If a laborer can dig 4 bushels of potatoes in an hour, how many bushels can he dig in 10 hours?

45. If the street-car fare is 5 cents, how much will 5 rides cost?

46. How many tea-spoons are there in 6 sets?

47. A physician visited 8 patients every day, for 6 days. How many visits did he make?

48. The railroad fare from Cleveland to Cincinnati is $7. What will the tickets for 6 passengers cost?

49. On a freight-train are 6 brakemen, each of whom earns $9 a week. How much do all of them earn?

50. In measuring depths at sea, 6 feet are a fathom. How many feet are there in 10 fathoms?

51. How many days are there in 7 weeks?

52. How many week-days are there in 9 weeks?

53. A miller can pack 8 barrels of flour in an hour. How many barrels can he pack in 7 hours?

54. What is the cost of a quarter of lamb that weighs 7 pounds, at 10 cents a pound?

55. If a joiner can make 8 doors in a week, how many doors can he make in 10 weeks?

56. A blackberry girl sold 10 quarts of berries, at 9 cents a quart. How much did she get for them?

57. She bought 9 pounds of sugar, at 9 cents a pound. How much did it cost her?

58. A music-teacher gives 8 lessons in a day. How many lessons does she give in 8 days?

59. Two men built a stone-wall in 10 days, building 10 rods each day. How many rods long was the wall?

60. At a certain sea-port are 9 pilots, each of whom piloted 8 vessels into the harbor in one week. How many vessels entered the harbor that week?

61. Which is the greater, $7 \times 9$ or $8 \times 8$? (See Manual, page 172.)

62. Multiply 2 successively by 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

63. Multiply 3 successively by 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

64. Multiply 4 successively by 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

65. How many are 0 time 5? 1 time 5? 2 times 5? 3 times 5? 4 times 5? 5 times 5? 6 times 5? 7 times 5? 8 times 5? 9 times 5? 10 times 5?

66. How many are 0 time 6? 1 time 6? 2 times 6? 3 times 6? 4 times 6? 5 times 6? 6 times 6? 7 times 6? 8 times 6? 9 times 6? 10 times 6?

67. Multiply 7 by 0, 1, 2, 3, 4, and so on to 10 inclusive.

68. Multiply 8 by 0, 1, 2, 3, 4, and so on to 10 inclusive.

69. Multiply 9 by each number from 0 to 10 inclusive.

70. Multiply 10 by each number from 0 to 10 inclusive.

## SECTION VI.

### *DIVISION.*

**8. From 2 in 2 and one half of 2, to 10 in 100 and one tenth of 100.**

1. If 3 hogsheads of sugar make one load for a dray, how many loads will 6 hogsheads make?
2. How many loads will 9 hogsheads make?
3. A drayman has 12 hogsheads to draw from a freight house. How many loads will they make?

(See Manual, page 172.)

4. At $3 apiece, how many summer coats can be bought for $3?
5. At 2 cents apiece, how many peaches can you buy for 8 cents? *Methods, page 175.*
6. How many double desks are required to seat 10 pupils?
7. A coppersmith gets three dollars apiece for making stove boilers. How many boilers must he make, to earn twenty-one dollars?
8. 6 skates are how many pairs?

9. A hatter received $14 for wool hats, at $2 apiece. How many hats did he sell?

10. 18 oxen are how many yoke?

11. 16 gloves are how many pairs?

12. How many cents must Asa have, to buy 20 marbles, if he gets 2 for a cent?

13. If one coat can be made from 3 yards of cloth, how many coats can be made from 18 yards?

14. How many 3-cent postage stamps can be bought for 24 cents?

15. A farmer sowed 30 bushels of plaster on a field of clover, sowing 3 bushels to the acre. How many acres of clover were there?

16. At $4 a ream, how many reams of letter-paper can I buy for $8?

17. If a family use 4 pounds of butter in one week, how many weeks will 20 pounds last them?

18. If 4 plums cost one cent, how many cents will 12 plums cost?

19. How much will 24 pounds of coffee cost, at the rate of 4 pounds for a dollar?

20. A canvassing agent received $36 for books, at $4 apiece. How many books did he sell?

21. How many horse shoes can a blacksmith set with 32 nails, using 8 nails for each shoe?

22. If you put 8 cows in 2 yards, putting the same number into each yard, how many cows will there be in one yard? *Methods, page 175.*

23. In 2 farm-yards are 4 horses, an equal number in each yard. How many horses are in one yard?

*When any number of things is separated or divided into two equal portions or parts, one of the parts is* **one half** *of the whole number.*

One half is written $\frac{1}{2}$.

24. How many are $\frac{1}{2}$ of 4 horses? $\frac{1}{2}$ of 8 cows?

25. A farmer has 6 calves in 2 yards, $\frac{1}{2}$ of them being in each yard. How many calves has he in one yard?

26. $\frac{1}{2}$ of 2 colts are how many colts?

27. A farmer having 10 sheep, put $\frac{1}{2}$ of them into his barn-yard. How many were in the barn-yard?

28. A milkman sold 2 quarts of milk for 12 cents. What was the price of a quart?

29. If 2 loaves of bread cost 16 cents, how much will one loaf cost?

30. If it takes 14 yards of carpeting to cover 2 flights of stairs, how many yards will it take to cover one flight?

31. A cheese-monger bought two cheeses for $18. How much did he pay apiece for them?

32. How much is the fare from Detroit to Milwaukee, if 2 tickets cost $20?

33. If I divide 6 pears equally among 3 girls, how many pears will each girl have?

34. If 4 boys together gather 8 quarts of chestnuts, how many quarts are there in each boy's share?

*When any number of things, ones, or units is divided into three equal parts, one part is* **one third** *of the number divided; and*

*When any number of things, ones, or units is divided into four equal parts, one part is* **one fourth** *of the number divided.*

One third is written $\frac{1}{3}$; and one fourth, $\frac{1}{4}$.

35. A physician charged a patient $3 for 3 visits. How much did he charge for one visit?

36. If I divide 18 Brazil-nuts equally among 3 children, how many nuts shall I give to each child?

37. If a steam-ship uses 27 tons of coal in 3 days, how much does she use in one day?

38. A farmer plowed 12 acres of land in 4 days. How many acres did he plow in one day?

39. In an orchard, 24 trees stand in 4 equal rows. How many trees are there in a row?

40. A lady used 20 yards of lace in making curtains for 4 windows. How many yards did she use for each window?

41. How many hours must a man work each day, to do 30 hours' work in 3 days?

42. If 4 quarts of blue-berries cost 28 cents, how much will one quart cost?

43. A furrier sold 4 buffalo-robes for $40. How much did he receive for each robe?

*44.* If 3 tons of coal cost $24, how much will 1 ton cost?

*45.* A carman drew 36 barrels of lime, at 4 equal loads. How many barrels did he draw at one load

In solving each of the first twenty-one problems in this Section, we found how many times one of two numbers of the same kind is contained in the other; and in solving each of the other problems, we separated one of two numbers into as many equal parts as there are ones in the other.

*Division* is the process of finding how many times one of two numbers is contained in the other; or of finding one of the equal parts into which a number may be divided.

The *Quotient* is the result obtained by division.

The *Dividend* is the number to be divided.

The *Divisor* is the number by which the dividend is to be divided.

The *Sign of Division,* made thus, ÷, when placed between two numbers, signifies that the number before it is to be divided by the number after it. It is read, "divided by." Thus, 35 ÷ 7 is read, "35 divided by 7."

*46.* The dividend is 28, and the divisor is 4. What is the quotient?

*47.* What is the quotient of $40 divided by 4?

*48.* 27 ÷ 3 = how many?

*49.* How many are 12 ÷ 2?

*50.* 15 ÷ 5 = what number?

*51.* A man paid $25 for coal, at $5 a ton. How many tons did he buy?

*52.* How many 5-dollar bills must a butcher pay, for a cow that costs him $40?

*53.* 35 miles are how many times 5 miles?

*54.* A grocer sells raisins, at 5 pounds for a dollar. How many dollars will he receive for 45 pounds?

55. A lady taught school 50 days, teaching 5 days in a week. How many weeks did she teach?

56. A carpenter framed a barn in 12 days. How many weeks did it take him?

57. He finished the barn in 24 days more. How many weeks was he in finishing it?

58. When shingle nails cost 6 cents a pound, how many pounds can be bought for 36 cents?

59. How many weeks are there in 42 working days?

60. 48 tea-spoons are how many sets?

61. Celia paid 18 cents for thread, at 6 cents a spool. How many spools did she buy?

62. If a farm hand can hoe 5 acres of corn in 5 days, how many acres can he hoe in one day?

63. Bertha picked 18 quarts of berries in 6 hours. How many quarts did she pick in one hour?

*When any number of things, ones, or units is divided into five equal parts, one part is* **one fifth** *of the number divided; and*

*When any number of things, ones, or units is divided into six equal parts, one part is* **one sixth** *of the number divided.*

One fifth is written $\frac{1}{5}$; and one sixth, $\frac{1}{6}$.

64. How many pens are $\frac{1}{5}$ of 10 pens?

65. How many pencils are $\frac{1}{6}$ of 6 pencils?

66. If 5 baskets of peaches cost $10, how much will one basket cost?

67. A piece of land containing 20 acres was fenced off into 5 equal fields. How many acres were there in each field?

68. A carpenter gave 30 cents for 5 lead-pencils. How much did he pay apiece for them?

69. One month a teamster fed 30 bushels of oats to 6 horses. How many oats did he feed to one horse?

70. A laborer bought a cow for $36, and paid for her in 6 equal, monthly payments. How much was each payment?

71. If 42 pounds of butter can be made from the milk of 6 cows, in a week, how many pounds can be made from the milk of one cow, at the same rate?

72. A joiner cut a strip of molding, 25 inches long, into 5 equal pieces. How long was each piece?

73. If one man can do a piece of work in 35 days, in how many days can 5 men do it?

74. In a garden are 48 strawberry plants, in 6 equal rows. How many plants are there in each row?

75. How many days will it take a man to do 54 hours' work, if he works 6 hours each day?

76. One 4th of July, Jerome spent 28 cents for firecrackers, at 7 cents a bunch. How many bunches did he buy?

77. How many bananas can be bought for 14 cents, at 7 cents apiece?

78. $60 \div 6 =$ how many?

79. A and B are driving on the road, in the same direction, and A is 56 rods ahead of B. In how many minutes will B overtake A, if he gains 7 rods in a minute?

80. How many weeks will it take a girl to braid 18 palm-leaf hats, if she braids 9 hats in a week?

81. Into how many lots, of 9 acres each, can 27 acres of land be divided?

82. How many papers of carpet tacks can be bought for 16 cents, at 8 cents a paper?

83. Nathan paid 9 cents for cocoa-nuts, at 9 cents apiece. How many cocoa-nuts did he buy?

84. At $8 a ton, how many tons of hay can be bought for $32? How many tons for $64?

85. 30 soldiers were detailed for duty, in squads of 10. Into how many squads were they divided?

86. How many papers of needles can be bought for 48 cents, at 8 cents a paper?

87. At 9 cents apiece, how many pine-apples can be bought for 36 cents? How many for 54 cents?

88. How many sheets of drawing paper can I buy for 40 cents, at 10 cents a sheet?

89. Ella paid 60 cents for strawberries, at 10 cents a quart. How many quarts did she buy?

90. Rosa bought some ribbon, at 8 cents a yard, and paid 72 cents for it. How many yards did she buy?

91. When filberts are 9 cents a pound, how many pounds can be bought for 63 cents?

92. At $8 a bushel, how many bushels of clover seed can be bought for $80?

93. David received 81 cents for walnuts, at 9 cents a quart. How many quarts did he sell?

94. How many bushels of charcoal, at 9 cents a bushel, can be bought for 90 cents?

95. How many bushels, at 10 cents a bushel?

96. A painter received $100 for painting wagons, at $10 apiece. How many wagons did he paint?

97. If 7 tons of coal cost $35, how much will one ton cost?

98. A grocer sold 7 bushels of cranberries for $21. How much did he get a bushel for them?

*One of seven equal parts into which any number of things, ones, or units may be divided, is* one seventh *of the number;*
*One of eight equal parts is* one eighth;
*One of nine equal parts is* one ninth; *and*
*One of ten equal parts is* one tenth.

One seventh is written $\frac{1}{7}$; one eighth, $\frac{1}{8}$; one ninth, $\frac{1}{9}$; and one tenth, $\frac{1}{10}$.

*99.* $\frac{1}{7}$ of 14 days are how many days?

*100.* $\frac{1}{8}$ of 8 reams of paper are how many reams?

*101.* A farmer used 56 rails in making 7 lengths of fence. How many rails did he use for each length?

*102.* One man can do a certain piece of work in 28 days. In how many days can 7 men do it?

*103.* A gentleman paid $63 for 7 weeks' board. How much was that per week?

*104.* Ira sold 7 bunches of grapes for 49 cents. How much did he get for one bunch?

*105.* Edwin paid 70 cents for 7 pints of pea-nuts. How much did they cost a pint?

*106.* A boot maker received $16 for making 8 pairs of coarse boots. How much did he receive for making one pair?

*107.* In a game of base-ball there were 8 boys on each side. One side kept their innings until they had had 24 knocks. How many knocks did each boy have?

*108.* A gardener sold 9 quarts of currants for 45 cents. How much did he get a quart for them?

*109.* If I give 20 apples for 10 pears, how many apples do I give for one pear?

*110.* A carman received 40 cents for drawing 8 barrels of flour. How much was that per barrel?

*111.* A crockery dealer bought 10 China tea-sets for $90. How much did one set cost him?

*112.* A wood dealer sold 10 cords of wood for $50. What was the price per cord?

*113.* A stove dealer bought 10 parlor stoves for $80. What was the price of each?

*114.* A boy sold 9 quarts of cherries for 72 cents. How much did he get a quart for them?

*115.* If 10 sets of silver-plated forks cost $60, how much will one set cost?

*116.* A farmer gathered 100 bushels of apples from 10 trees. How many bushels was that to each tree?

*117.* A blacksmith paid 56 cents for 8 pounds of nail-rod iron. How much was the iron per pound?

*118.* A merchant paid 72 dollars for 8 pieces of dress goods. How much did they cost per piece?

*119.* How many times is 2 contained in 2? In 4? In 6? In 8? In 10? In 12? In 14? In 16? In 18? In 20?

*120.* Divide by 3, from 3 in 3 to 3 in 30, thus: 3 in 3, once; 3 in 6, 2 times; 3 in 9, 3 times; and so on.

*121.* Divide by 4, from 4 in 4 to 4 in 40; thus: 4 in 4, once; 4 in 8, 2 times; 4 in 12, 3 times; and so on.

*122.* How much is $\frac{1}{2}$ of 2? $\frac{1}{2}$ of 4? $\frac{1}{2}$ of 6? $\frac{1}{2}$ of 8? $\frac{1}{2}$ of 10? $\frac{1}{2}$ of 12? $\frac{1}{2}$ of 14? $\frac{1}{2}$ of 16? $\frac{1}{2}$ of 18? $\frac{1}{2}$ of 20?

(See Manual, page 172.)

*123.* How much is $\frac{1}{3}$ of 3? $\frac{1}{3}$ of 6? $\frac{1}{3}$ of 9? $\frac{1}{3}$ of 12? $\frac{1}{3}$ of 15? $\frac{1}{3}$ of 18? $\frac{1}{3}$ of 21? $\frac{1}{3}$ of 24? $\frac{1}{3}$ of 27? $\frac{1}{3}$ of 30?

*124.* How much is $\frac{1}{4}$ of 4? $\frac{1}{4}$ of 8? $\frac{1}{4}$ of 12? $\frac{1}{4}$ of 16? $\frac{1}{4}$ of 20? $\frac{1}{4}$ of 24? $\frac{1}{4}$ of 28? $\frac{1}{4}$ of 32? $\frac{1}{4}$ of 36? $\frac{1}{4}$ of 40?

*125.* How many times is 5 contained in 5? In 10? In 15? In 20? In 25? In 30? In 35? In 40? In 45? In 50?

*126.* Divide by 6, from 6 in 6 to 6 in 60; thus: 6 in 6, once; 6 in 12, 2 times; 6 in 18, 3 times; and so on.

*127.* Divide by 7, from 7 in 7 to 7 in 70.

*128.* Find, successively, $\frac{1}{5}$ of 5, 10, 15, 20, 25, 30, 35, 40, 45, and 50.

*129.* Find, successively, $\frac{1}{6}$ of 6, 12, 18, 24, 30, 36, 42, 48, 54, and 60.

*130.* Find, successively, $\frac{1}{7}$ of 7, 14, 21, 28, 35, 42, 49, 56, 63, and 70.

*131.* Divide by 8, from 8 in 8 to 8 in 80.

*132.* Divide by 9, from 9 in 9 to 9 in 90.

*133.* Divide by 10, from 10 in 10 to 10 in 100.

*134.* Find, successively, $\frac{1}{8}$ of 8, 16, 24, 32, 40, 48, 56, 64, 72, and 80.

*135.* Find, successively, $\frac{1}{9}$ of 9, 18, 27, 36, 45, 54, 63, 72, 81, and 90.

*136.* Find, successively, $\frac{1}{10}$ of 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100.

## SECTION VII.

### *REVIEW PROBLEMS.*

*1.* EMMA bought 2 lead-pencils, at 5 cents apiece, and a sheet of drawing paper for 8 cents. How much money did she pay out?

*2.* A man earns \$9 a week, and his son \$4. If the father works 4 weeks, and the son 1 week, how much do they earn? *Methods, page 175.*

*3.* A farmer gave 10 barrels of apples, worth \$3 a barrel, and \$5 in money, for a suit of clothes. What was the cost of the clothes?

*4.* How many days are 5 times 8 days, + 9 days?

*5.* How many hours are 7 times 7 hours, + 10 hours?

*6.* How many miles are 9 times 6 miles, + 7 miles?

*7.* 8 times 7 feet, + 6 feet are how many feet?

*8.* 6 times 10 yards, + 3 yards are how many yards?

9. Aaron sold 4 melons, at 9 cents apiece, and expended all the money but 6 cents for a slate. How much did the slate cost him? *Methods, page 175.*

10. Julius gave 2 10-cent pieces to pay for a writing-book, and received 5 cents in change. What was the cost of the writing-book?

11. How many bushels are 4 times 7 bushels,— 9 bushels?

12. How many pecks are 3 times 9 pecks,— 5 pecks?

13. 6 × 7 quarts,— 4 quarts = how many quarts?

14. 9 × 5 pints,— 10 pints = how many pints?

15. If C travels east 3 miles an hour, and B west 5 miles an hour, how far apart will they be in 6 hours?
(See Manual, page 173.)

16. If they both travel in the same direction, how far apart will they be in 8 hours?

17. A grocer sold 7 pounds of starch to one customer, and 3 pounds to another, at 9 cents a pound. How much did he receive?

18. If 7 pairs of cuffs can be made from 1 yard of linen, how many pairs can be made from two pieces, one containing 4 yards, and the other 5 yards?

19. How many gallons are 6 × 3 gallons, + 4 gallons?

20. How many half-pints are 10 times 2 half-pints, + 6 half-pints?

21. A grocer having 14 oranges, sold all but 5 of them, at 3 cents apiece. How much did he get for those he sold?

22. How much will be the cost of 9 sheep, at $3 apiece; and 2, at $4 apiece?

23. A confectioner sold 7 ounces of candy, at 6 cents an ounce; and 2 ounces, at 5 cents an ounce. How much did he receive?

24. Pauline practices on her piano 3 hours every week-day, and spends 2 hours with her drawing 3 times in a week. How many hours in a week does she devote to drawing and music?

25. 9 times 7 + 2 times 5 = how many?

26. 10 times 5 + 3 times 3 = how many?

27. 3 times 10 are how many more than 4 times 2?

28. 8 times 7, — 6 are how many?

29. 4 times 9, — 5 are how many?

30. How many are 9 times 6, less 7?

31. How many are 7 times 5, less 8?

32. If 3 men can dig a ditch in 9 days, how many men can dig it in one day? *Methods, page 175.*

33. If 5 men can lay a wall in 7 days, in how many days can one man lay it?

34. How many men will be required to lay the same wall in one day?

35. A ton of hay will keep 9 sheep 4 months. How many months will it keep one sheep?

36. How many months will it keep 6 sheep?

37. If 3 cords of wood cost $18, how much will 1 cord cost? How much will 5 cords cost?

38. In how many days can 6 men dig a cellar, that 3 men can dig in 10 days?

39. A mechanic can build a sidewalk in 5 days, working 6 hours a day. In how many days can he build it, working 10 hours a day?

40. If 63 yards of blue broadcloth will make 7 uniforms, how many yards will make 4 uniforms?

41. 4 times 9 are how many times 6? *Methods, page 175.*

42. 3 times 10 are how many times 5? How many times 6?

*43.* 6 times 4 are how many times 3? How many times 2? How many times 8? How many times 12?

The factors of 12, in sets of two each, are 2 and 6, or 3 and 4.

*44.* What are the factors of 14, in sets of 2 each? Of 15? Of 16? Of 18? (See Manual, page 173.)

A number that can be separated into factors, is a *Composite Number.*

*45.* Name, in sets of two each, the factors of all the composite numbers from 1 to 10. From 10 to 20.

*46.* Name, in sets of two, the factors of the composite numbers from 20 to 30, not using any factor greater than 10.

*47.* In the same manner, name, in sets of two each, the factors of all the composite numbers from 30 to 40. From 40 to 50. From 50 to 60.

*48.* Name, in sets of two, the factors of the composite numbers from 60 to 100, not using any factor greater than 10.

*49.* 54 is how many times 9?

*50.* 64 is how many times 8?

*51.* 36 is how many times 4? How many times 6?

*52.* 28 is 4 times what number?

*53.* 45 is 9 times what number?

*54.* 63 is 7 times what number?

*55.* How much is $\frac{1}{2}$ of 2 times 10? *Methods, page 175.*

*56.* How much is $\frac{1}{3}$ of 6 times 6?

*57.* How much is $\frac{1}{10}$ of 6 times 5?

*58.* How much is $\frac{1}{4}$ of 2 times 6?

*59.* If $\frac{1}{2}$ ton of hay costs \$7, how much will a ton cost?

*60.* If $\frac{1}{8}$ acre of land is worth \$10, how much is 1 acre worth?

*61.* If a mechanic can earn 9 cents in $\frac{1}{5}$ of an hour, how much can he earn in an hour?

*62.* Of what number is 1 1 half? 1 third? 1 fourth? 1 fifth? 1 sixth? 1 seventh? 1 eighth? 1 ninth? 1 tenth?

63. Of what number is 2 1 half? 1 third? 1 fourth? 1 fifth? 1 sixth? 1 seventh? 1 eighth? 1 ninth? 1 tenth?

64. Of what number is 3 1 half? 1 third? 1 fourth? 1 fifth? 1 sixth? 1 seventh? 1 eighth? 1 ninth? 1 tenth?

65. Of what number is 4 1 half? 1 third? 1 fourth? 1 fifth? 1 sixth? 1 seventh? 1 eighth? 1 ninth? 1 tenth?

66. Name, successively, the numbers of which 5 is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, and $\frac{1}{10}$. (See Manual, page 173.)

67. Name, successively, the numbers of which 6 is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, and $\frac{1}{10}$.

68. Name, successively, the numbers of which 7 is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, and $\frac{1}{10}$.

69. Name, successively, the numbers of which 8 is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, and $\frac{1}{10}$.

70. Name, successively, the numbers of which 9 is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, and $\frac{1}{10}$.

71. A miller sold a barrel of fine flour for \$7, a barrel of family flour for \$9, and a barrel of XX flour for \$11. What was the average price? *Methods, p. 175.*

72. Martin's standing in his arithmetic class on Monday was 7; on Tuesday, 9; on Wednesday, 6; on Thursday, 10; and on Friday, 8. What was his average standing for the week?

73. A butcher bought 2 calves, at \$7 apiece, and one calf for \$10. What was their average cost?

74. In 4 hours a horse traveled 6 miles, 9 miles, 8 miles, and 5 miles. What was his average rate of speed?

75. How much is 7 times $\frac{1}{8}$ of 72?

76. How much is 9 times $\frac{1}{7}$ of 35?

77. How much is 6 times $\frac{1}{9}$ of 63?

78. How much is 8 times $\frac{1}{4}$ of 28?

79. How much is 5 times $\frac{1}{10}$ of 80?

80. How much is 10 times $\frac{1}{9}$ of 81? (See Manual, page 173.)

# CHAPTER II.

## SECOND COURSE IN INTEGERS.

## SECTION I.

### *ADDITION.*

### 9. From 10 and 10 to 100 and 100.

1. If a cultivator costs $10, and a cart $30, what is the cost of both?

2. A traveler has come 40 miles, and he has 30 miles yet to go. What is the length of his journey?

3. At what price must an agent sell a sewing-machine, that cost him $80, to gain $20?

4. A merchant bought a chest of Old Hyson tea, containing 90 pounds, and a chest of Young Hyson, containing 60 pounds. How many pounds of tea were there in both chests?

5. A butcher killed two sheep, one of which weighed 60 pounds, and the other 70 pounds. How much did both sheep weigh?

6. A farmer sows 20 acres of land to oats, 30 to wheat, and 10 to corn. How many acres does he sow?

7. A farmer has 30 Saxony, 40 South-Down, and 50 merino sheep. How many sheep has he?

8. I paid 30 cents for a pound of coffee, and 14 cents for a quart of molasses. How much did I pay for both? *Methods, page 175.*

9. A boy gave 60 cents for a knife, and 25 cents for a box of water-colors. How many cents did he give for both?

10. A grazier has 70 head of cattle in one pasture, and 41 head in another. How many cattle has he in both pastures?

11. A cotton manufacturer sold 40 bales of sheetings, and 38 bales of shirtings. How many bales of both kinds of goods did he sell?

12. In one week a shoe dealer sold 70 cases of boots, and 56 cases of shoes. How many cases did he sell?

13. A retail dealer bought 30 pairs of gloves, 40 pairs of mittens, and 18 pairs of gauntlets. How many pairs of all kinds did he buy?

14. One day a peddler sold a gold, hunter-case watch for $100, an open-face, gold watch for $60, and a silver watch for $25. How much did he receive for the three watches?

15. A railroad company bought 80 cords of wood at one station, 63 cords at another, and 4 cords at a third. How many cords of wood did they buy?

16. In a village school are 24 girls, and 15 boys. How many pupils are in that school?

17. Enos gave 21 cents for a picture, and 18 cents for a frame. How much did both cost him? *Methods, 175.*

18. Harriet paid 63 cents for tea, and 31 cents for coffee. How much did her purchases amount to?

19. A marble dealer paid $48 for a block of marble, and $12 for freight on it. What was the whole cost?

20. Owen gave 45 cents for a pair of skates, and 18 cents for straps. How much did they cost him?

21. Helen's furs cost $28, and Lucy's cost $27. How much did both sets cost?

22. Eva paid 38 cents for lace, and 25 cents for ribbon. How much did she pay for both?

23. In one week a hotel keeper received $37 from boarders, and $54 from travelers. What were his receipts for the week?

24. A farmer has 89 sheep, and 24 lambs. How many sheep and lambs has he?

25. Upon a steam-boat there are 92 gentlemen, and 57 ladies. How many passengers are on the boat?

26. How many men are 96 men + 15 men?

27. How many horses are 41 horses and 98 horses?

28. $34 + $27 + $45 = how many dollars?

29. 56 sheep + 18 sheep + 68 sheep = how many sheep?

30. What is the sum of 44, 37, 16, and 7?

## SECTION II.

### *SUBTRACTION.*

### 10. From 20 minus 10 to 200 minus 100.

1. A MAN owing a debt of $30, paid all but $10. How much did he pay? *Methods, page 175.*

2. Jesse had 100 cents, but he paid 20 cents for admittance to a concert. How many cents had he left?

3. A fish-monger sold 60 pounds of steak, from a halibut that weighed 80 pounds. How much remained unsold?

4. From a hogshead of West India molasses which contained 110 gallons, 70 gallons have been drawn out. How many gallons are left?

5. Philip threw his ball against a barn 50 feet distant, and it rebounded 30 feet. How far was it then from him?

6. A cutler having 90 knives, sold 40 of them. How many had he left?

7. A tinman having 70 sheets of tin, used 50 sheets for pans, and the rest for pails. How many sheets did he make into pails?

8. A lady went shopping with $63, and had $20 when she returned. How much had she spent?

9. Of 75 guests who arrived at a hotel in one day, 40 remained over night. How many left the same day?

10. A farmer having 79 fleeces of wool, sold 30 fleeces. How many had he left?

11. A physician paid $87 for a horse, and $60 less for a harness. How much did the harness cost him?

12. A vintner shipped 96 bottles of wine to a customer, but only 80 reached the customer unbroken. How many were broken?

13. A book-binder bought 72 sheets of straw-board, and used 60 of them. How many had he left?

14. A builder bought 90 barrels of water-lime, and used 81 barrels. How many barrels had he left?

15. A grain buyer bought wheat at 90 cents a bushel, and sold it at 108 cents. How much did he gain a bushel?

16. Elvira is 16 years old, and Laura is 13 years younger. How old is Laura?

17. From a piece of sheeting containing 39 yards, a merchant sold 15 yards. How many yards were left in the piece? *Methods, page 176.*

18. A shoe dealer bought 48 boxes of blacking, and sold 25 boxes. How many boxes had he left?

19. Luke and Ezra ran a race. Luke ran 69 rods, while Ezra ran 58. How many rods did Luke beat Ezra?

20. A manufacturer made 53 hay rakes in a week, and sold 44 of them. How many had he left?

21. A farmer carried 72 bundles of straw to the city, and sold 56 bundles in the forenoon. How many had he to sell in the afternoon?

22. A coal dealer bought 83 tons of stove coal, and 57 tons of chestnut coal. How much more of the stove than of the chestnut coal did he buy?

23. A grocer bought one cheese weighing 91 pounds, and another weighing 26 pounds less. How much did the second cheese weigh?

24. Upon a note of $75, $47 have been paid. How much is yet due?

25. In my farm there are 84 acres, 19 acres of which are woodland. How much cleared land have I?

26. In the town of Essex there are 76 square miles, and in Franklin 39 square miles less. How many square miles are there in Franklin?

27. 97 — 49 = how many?

28. 103 pigeons — 69 pigeons = how many pigeons?

29. 111 swallows are how many more than 28 swallows?

30. 108 robins — 99 robins are how many robins?

31. 56 cents are how many less than 100 cents?

## SECTION III.

### *MULTIPLICATION.*

### 11. From 10 times 10 to 10 times 100.

1. At $20 an acre, how much will 3 acres of land cost?
2. A merchant sold 4 shawls, at $30 apiece. How much did he receive for them? *Methods, page 176.*
3. How many yards in 5 pieces of brown linen, each piece containing 40 yards?
4. A wagon maker sold 3 light wagons, at $90 apiece. How much did he get for them?
5. How much will 50 pounds of sugar cost, at 10 cents a pound?
6. How much must I pay for 40 boxes of table salt, at 9 cents a box?
7. How many yards in 2 pieces of carpeting, each piece containing 70 yards?
8. A man traveled 7 miles an hour for 60 hours. How far did he travel?
9. How much will 40 silk vests cost, at $6 apiece?
10. How many acres of land in 8 Government lots, of 80 acres each?
11. How much will 3 pounds of butter cost, at 23 cents a pound? *Methods, page 176.*
12. How many yards are there in 4 pieces of oil-cloth, each piece containing 42 yards?
13. If a boy earns 31 cents a day, how much can he earn in 5 days?
14. A cooper made 9 barrels a day, for 71 days. How many barrels did he make?
15. At $35 apiece, how much will 3 cutters cost?

16. How much must be paid for 2 barrels of pork, at $26 a barrel?

17. How much must be paid for 4 bales of hops, at $44 a bale? *Methods, page 176.*

18. A fruit dealer bought 28 cocoa-nuts, at 8 cents apiece. How much did they cost him?

19. How much must be paid for bottoming 6 cane-seat chairs, at 45 cents a piece?

20. In a barrel of N. Y. State salt are 5 bushels, of 56 pounds each. How many pounds are in a barrel?

21. How far will a railroad train run in 9 hours, running 28 miles an hour?

22. A field of 10 acres of barley yielded 36 bushels to the acre. What was the total yield?

23. At 75 cents apiece, how much will 6 school readers cost?

24. If I pay 6 cents for the use of 1 dollar for a year, how much must I pay for the use of 37 dollars?

25. How much will 84 pairs of boots cost, at $5 a pair?

26. How much will 69 yards of cassimere cost, at $2 a yard?

27. What will be the railroad fare from A to B, 98 miles, at 3 cents a mile?

28. A paper maker sold 93 reams of book paper, at $7 a ream. How much did it come to?

29. A freight-train of 10 cars is loaded with flour, each car carrying 86 barrels. How many barrels are on the train?

30. How much will 4 cows cost, at $79 apiece?

31. How much will 8 sewing-machines cost, at $56 each?

32. How much will 7 acres of land cost, at $65 an acre?

33. How much will 47 tons of hay cost, at $10 a ton?

34. A steam-boat plys between two places that are 59 miles apart. How many miles does she make in 8 trips?

35. 9 times 81 are how many?

36. 4 times 67 are how many?

37. 5 times 34 are how many?

38. 7 × 27 = how many?

39. 6 × 83 = how many?

40. 8 × 95 = how many?

41. 88 × 3 = how many?

## SECTION IV.

### *DIVISION.*

### 12. From 2 in 20 to 10 in 1000.

1. A FARM hand received $60 for 3 months' work. How much were his monthly wages?

2. A milliner sold 4 yards of ribbon for 80 cents. What was the price per yard? *Methods, page 176.*

3. A teacher paid 360 cents for 9 dozen lead pencils. How much did they cost him a dozen?

4. If a factory girl can weave 180 yards of cloth in 6 days, how much can she weave in a day?

5. A dairy-man sold 9 cheeses, the total weight of which was 630 pounds. What was their average weight?

6. A milkman bought 8 cows for $320. What was their average cost?

7. 5 persons earned $250 in a month. What were their average monthly earnings?

8. A butcher killed 8 sheep, the aggregate weight of which was 720 pounds. What was their average weight?

9. At what price per light will 8 lights of French plate-glass cost $400?

10. How many barrels of lime can be bought for $153, at $3 a barrel?

11. A man threshed 48 bushels of beans in 3 days. How many bushels did he average per day? *Methods, 176.*

12. If 6 boys pick up 96 bushels of apples in a day, what is the average number of bushels to a boy?

13. Olivia expended 75 cents for grapes, at 5 cents a bunch. How many bunches did she buy?

14. How many suits of clothes can be made from 91 yards of cloth, allowing 7 yards to a suit?

15. How many weeks will 108 loaves of bread last a family, that use 9 loaves a week? *Methods, page 176.*

16. A lady teacher received $175 for 7 months' services. How much did she receive per month?

17. A farm of 415 acres is to be divided equally among 5 heirs. How many acres will each heir receive?

18. A crockery dealer sold 144 plates, in sets of 6 plates. How many sets did he sell?

19. A lawyer paid $110 for 5 months' board. How much did he pay per month?

20. A farmer received $301 for wood, at $7 a cord. How many cords did he sell?

21. In making a book of 224 pages, 7 sheets of paper are used. How many pages of the book does each sheet of paper make?

22. How many hours will it take a steam-boat to run 280 miles, running 8 miles an hour?

23. If 648 chestnuts be divided equally among 9 boys, how many will each boy receive?

24. A railroad train ran 198 miles in 6 hours. What distance did it run per hour?

25. A farmer put up 238 gallons of cider in 7 casks. How much did he put into each cask?

26. A merchant's store expenses are $10 a day. In how many days will his expenses amount to $780?

27. During a heavy rain storm, a cistern that will hold 432 barrels of water, was filled in 8 hours. How much water ran into the cistern every hour?

28. A mechanic bought a house and lot for $840, and paid for it in 7 equal payments. How much was each payment?

29. How many pairs of boots, at $6 a pair, can be bought for $594?

30. If 7 pounds of crushed sugar cost 119 cents, how much will 1 pound cost?

31. At $10 a barrel, how many barrels of fish can be bought for $750?

32. How many cistern pumps, at $8 apiece, can be bought for $448?

33. If 7 coal stoves cost $308, what is the price of 1?

34. At how much apiece will 6 lumber wagons cost $588?

35. At what price per acre will 10 acres of land cost $910?

## SECTION V.

### *REVIEW PROBLEMS.*

1. One winter, a farmer fed 5 tons of hay to his horses, 6 tons to his sheep, and 14 tons to his cows. How much hay did it take to winter his live stock?
2. How many feet have all the quadrupeds in this picture?
3. How many pounds of wool are there in 11 fleeces, that average 5 pounds each?
4. Anson bought 7 doves, paying 18 cents apiece for them. How much did they cost him?
5. How much would the teeth for a 24-tooth harrow cost, at 9 cents each?
6. A farmer milks 9 cows, and obtains 135 quarts of milk daily. What is the average number of quarts to a cow?

7. If 1 horse eats 12 quarts of oats in a day, how many quarts will 2 horses eat in the month of April?

8. How many pecks, there being 8 quarts in a peck?

9. How many bushels, there being 4 pecks in a bushel?

10. A village school-house has two rooms, one of which contains seats for 50 pupils, and the other, seats for 60. How many pupils can be seated in both rooms?

11. A newsboy distributes 49 morning papers, and 67 evening papers. How many papers does he distribute each day?

12. A dealer bought 29 bushels of sweet apples, and 76 bushels of sour ones. How many apples did he buy?

13. A telegraph operator sent one dispatch of 84 words, and another of 66 words. How many words were there in the two dispatches?

14. Matthew attended school 65 days in the summer, and 76 days in the winter. How many days did he attend school in the year?

15. I paid a carpenter $72 for building a fence, and the lumber cost me $35. What was the cost of the fence?

16. A florist has 60 varieties of roses, 30 varieties of dahlias, and 17 varieties of geraniums. How many varieties of the three kinds of flowers has he?

17. If you start from the school-house, and walk east 90 rods, and then west 50 rods, how far will you be from the school-house?

18. At a foundery, 97 tons of iron were used in January, and 27 tons less in February. How many tons were used in February?

19. Mark dug 62 bushels of potatoes in two days, digging 35 bushels the first day. How many bushels more did he dig the first day than the second?

20. At $90 a thousand, how much will 9 thousand hop-poles cost?

21. A surveyor received $174 for his services, at $6 a day. How many days was he employed?

22. At 8 cents apiece, how much will 48 cocoa-nuts cost?

23. How many lengths, each 9 feet long, are there in a post-and-rail fence 783 feet long?

24. If A can build 8 rods of wall while B builds 5 rods, how many rods can he build while B builds 35 rods?

25. A person bought 3 books, giving for the first a 25-cent currency note, and receiving back 10 cents; for the second he gave 20 cents more than the first cost him, and received back 5 cents; the third book cost him as much as the other two, and he sold it for 50 cents. How much did he gain on the third book?

26. Philip lives 40 rods from the school-house, Edwin 50 rods further away, and Arthur 60 rods further than Edwin. How far does each have to walk in coming to school?

27. In building a school-house, a mason worked 46 days, a carpenter 64 days, and a painter 18 days. How many days did they all work upon it?

28. A steam-ship sailed from New York for Liverpool with 72 first-class, 45 second-class, and 16 steerage passengers. How many passengers did she carry?

29. A man owing $86, paid $49 one day, and $18 the next day. How much did he then owe?

30. A map agent took 53 subscriptions in January, 34 in February, 47 in March, and 39 in April. How many orders did he take in the four months?

31. A wood dealer sold to three persons, 12 cords, 44 cords, and 36 cords of wood, and had 29 cords left. How many cords had he at first?

32. From a kiln of 100 thousand brick, 31 thousand were sold to one builder, and 53 thousand to another. How many brick were left in the kiln?

33. Seth had 105 cents, but he has given 28 cents to Edmund, 35 cents to John, 19 cents to Horace, and 16 cents to Melvin. How many cents has he left?

34. A merchant has 74 yards of cloth in three pieces, one of which contains 29 yards, and another 32 yards. How many yards are there in the third piece?

35. A livery-stable keeper paid $98 for a horse, and $15 for his keeping. He received $36 for his use, and sold him for $80. Did he gain or lose, and how much?

36. A manufacturer made 73 pairs of window-blinds one week, and 47 pairs the next, and in the two weeks sold 54 pairs. How many pairs had he left?

37. Gilbert paid 75 cents for a sled, and 50 cents for a knife, and gave them both for a pair of skates worth 100 cents. Did he gain or lose, and how much?

38. I owe $120; $20 to A, $36 to B, $41 to C, and the balance to D. How much do I owe to D?

39. Oscar had 46 cents, and Clarence 60. Oscar earned as many cents as Clarence spent, and he then had 55 cents. How many cents did Clarence then have?

40. A bought a watch for $65, and offered to sell it for $20 more than cost, but finally sold it for $16 less than his asking price. At what price did he sell it?

41. If I go east 57 miles, then west 24 miles, then east 17 miles, and then west 32 miles, will I be east or west from the place of starting, and how far?

42. From a roll of carpeting containing 120 yards, three carpets of 28 yards, 36 yards, and 44 yards were cut. How many yards were left in the roll?

43. If I deposit $64 and $70 in a bank, and draw out $48, $36, and $25, how much will I have left in the bank?

44. The railroad distance between Syracuse and Rochester is 81 miles. If one man leaves Syracuse, and travels toward Rochester 5 miles an hour, and another leaves Rochester, and travels 4 miles an hour toward Syracuse, how far will they be apart in 1 hour?

45. How far will each have traveled in 5 hours?

46. How far will they be apart in 7 hours?

47. In how many hours will they meet?

48. When they meet, how far will each have traveled?

49. How far will the Rochester man go, while the Syracuse man is going 45 miles?

50. Mabel bought 10 yards of calico, at 13 cents a yard, and 8 yards of ribbon, at 20 cents a yard. How much did her purchases amount to?

51. A drover bought 25 sheep, at $2 apiece; 34, at $3 apiece; and 18, at $4 apiece. How many sheep did he buy?

52. How much did they cost him?

53. What is the sum of 10 times 7, and 3 times 9?
54. What is the sum of $6 \times 8$ and $5 \times 7$?
55. What is the sum of $4 \times 7$ and $8 \times 9$?
56. What is the difference between $9 \times 6$ and $7 \times 7$?
57. What is the difference between $10 \times 6$ and $6 \times 8$?
58. What is the difference between $8 \times 7$ and $5 \times 9$?

59. If 1 bushel of wheat is worth as much as 2 bushels of corn, and 1 bushel of corn as much as 2 bushels of oats, how many bushels of oats are worth as much as 76 bushels of wheat?

60. A merchant bought 5 pieces of cambric, each piece containing 41 yards, at 10 cents a yard. How much did it cost him?

61. How many quires of paper, at 20 cents a quire, can be bought for 6 yards of cloth, at 30 cents a yard?

62. A boy exchanged 3 dozen of eggs, at 32 cents a dozen, for 4 pounds of raisins. What was the price of the raisins?

63. In how many months will 8 horses eat as much as 10 horses will eat in 12 months?

64. In how many days can 7 men earn as much as 6 men can earn in 14 days?

65. How much grass seed, at $4 a bushel, will pay for 12 barrels of apples, at $3 a barrel?

66. How many hoes, at 80 cents each, can be bought for 10 brooms, at 32 cents each?

67. A man has a job of work that he can do in 192 days. If he employs 5 men to assist him, in how many days will they do it?

68. If 8 men can lay a mile of railroad track in 15 days, in how many days can 12 men lay it?

69. If 5 yards of calico cost 80 cents, how much will 9 yards cost?

70. If a workman earns $72 in 8 weeks, how much can he earn in 24 weeks?

71. If a ship sails 42 miles in 7 hours, how far will she sail in 20 hours?

72. How many peaches, at the rate of 4 for 8 cents, can you buy for 22 cents?

73. A boy sold 16 bunches of grapes, at the rate of 3 bunches for 15 cents. How much did he get for them?

74. A farmer sold 8 barrels of apples at $4 a barrel, and enough more at $3 a barrel, to realize $101. How many barrels did he sell at the second price?

75. One Fourth of July, Orrin had 83 cents. He bought 4 bunches of fire-crackers, at 12 cents a bunch, and spent the rest of his money for pea-nuts, at 7 cents a cup. How many cups of pea-nuts did he buy?

76. A fruit dealer bought 24 baskets of peaches, at $2 a basket, and sold them all for $60. How much was his gain?

77. A furniture dealer bought 8 wash-stands for $40, and sold them at $6 apiece. How much did he gain?

78. A drover bought 75 sheep for $225, and sold them at $4 apiece. How much did he gain?

79. A mechanic worked for a grocer 17 days, at $3 a day, and received in pay $19 in money, and the balance in groceries. How many dollars' worth of groceries did he get?

80. If the wages of 3 men for 6 days are $36, what are the wages of 4 men for 8 days?

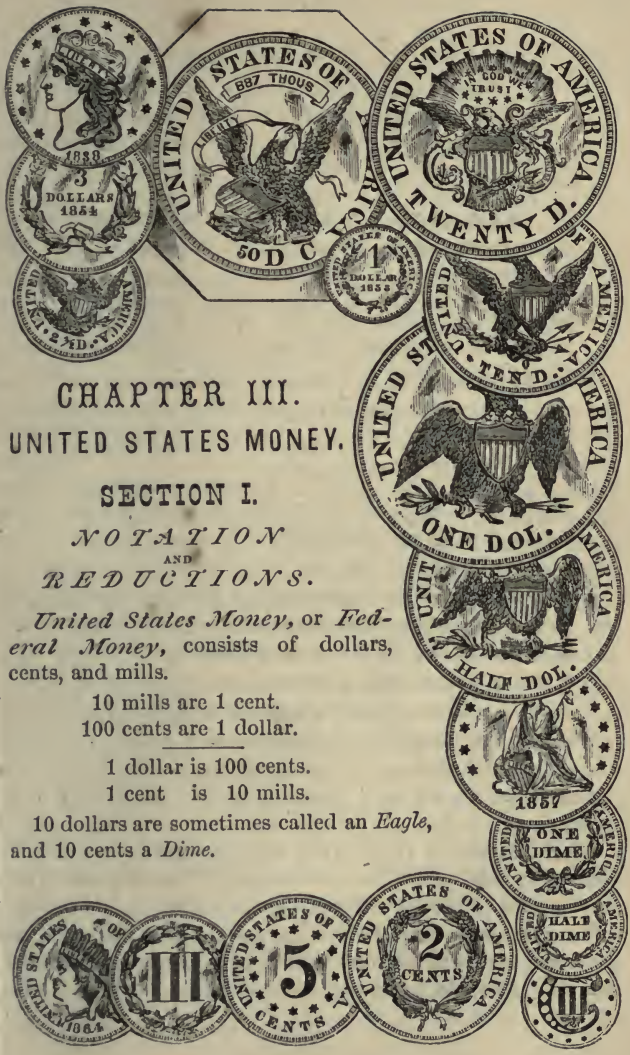
*81.* If 4 men build 40 rods of wall in 5 days, how many rods will 10 men build in 6 days?

*82.* 8 men, in 6 days, made 144 pairs of shoes. At the same rate, how many pairs will 9 men make in 7 days?

*83.* If 7 sewing girls can make 56 vests in 4 days, how many vests can 16 girls make in 9 days?

*84.* A dairy-man who had 20 cows, made 900 pounds of cheese in 15 days. At the same rate, how many pounds of cheese can be made in 11 days, from the milk of 13 cows?

*85.* 10 times $\frac{1}{3}$ of 24 are how many?
*86.* 4 times $\frac{1}{7}$ of 35 are how many?
*87.* 9 times $\frac{1}{8}$ of 48 are how many?
*88.* 7 times $\frac{1}{10}$ of 60 are how many?
*89.* 8 times $\frac{1}{4}$ of 72 are how many?
*90.* 6 times $\frac{1}{5}$ of 95 are how many?
*91.* 5 times $\frac{1}{9}$ of 108 are how many?
*92.* 3 times $\frac{1}{8}$ of 176 are how many?
*93.* How many are 4 times $\frac{1}{2}$ of 10 times 3?
*94.* How many are 6 times $\frac{1}{3}$ of 5 times 9?
*95.* How many are 5 times $\frac{1}{4}$ of 6 times 12?
*96.* How many are 8 times $\frac{1}{3}$ of 9 times 4?
*97.* How many are 7 times $\frac{1}{4}$ of 6 times 15?
*98.* How many are 9 times $\frac{1}{5}$ of 8 times 7?
*99.* 9 is $\frac{1}{4}$ of what number?
*100.* 8 is $\frac{1}{3}$ of what number?
*101.* 15 is $\frac{1}{5}$ of what number?
*102.* $\frac{1}{3}$ of 104 is $\frac{1}{4}$ of what number?
*103.* $\frac{1}{2}$ of 215 is $\frac{1}{5}$ of what number?
*104.* $\frac{1}{3}$ of 252 is $\frac{1}{4}$ of what number?




# CHAPTER III.

## UNITED STATES MONEY.

### SECTION I.

### *NOTATION* AND *REDUCTIONS.*

*United States Money,* or *Federal Money,* consists of dollars, cents, and mills.

10 mills are 1 cent.
100 cents are 1 dollar.

1 dollar is 100 cents.
1 cent is 10 mills.

10 dollars are sometimes called an *Eagle,* and 10 cents a *Dime.*

UNITED STATES COIN TABLE.

| METALS. | NAMES OF COINS. | VALUES. | METALS. | NAMES OF COINS. | VALUES. |
|---|---|---|---|---|---|
| Gold, | 50-dollar piece, | $50.00 | Silver, | Dollar, | $1.00 |
| | Double eagle, | 20.00 | | Half-dollar, | .50 |
| | Eagle, | 10.00 | | Quarter-dollar, | .25 |
| | Half-eagle, | 5.00 | | Dime, | .10 |
| | 3-dollar piece, | 3.00 | | Half-dime, | .05 |
| | Quarter-eagle, | 2.50 | | 3-cent piece, | .03 |
| | Dollar, | 1.00 | Nickel, | 5-cent piece, | .05 |
| Copper, | 2-cent piece, | .02 | | 3-cent piece, | .03 |
| | Cent, | .01 | | Cent, | .01 |

If we divide a dollar into 10 equal parts, each of the parts is 1 *tenth* of the dollar, and is called 1 *dime;* 2 of the parts are 2 *tenths* of a dollar, or 2 *dimes;* 3 parts are 3 *tenths* of a dollar, or 3 *dimes*, and so on.

Dividing each of the tenths of a dollar, or each dime, into 10 equal parts, we have in the whole dollar 10 times 10, or 100 equal parts. Each of these parts is 1 *hundredth* of a dollar, and is called 1 *cent.*

Dividing each of the hundredths of a dollar, or each cent, into 10 equal parts, we have in the whole dollar 100 times 10, or 1,000 equal parts. Each of these parts is 1 *thousandth* of a dollar, and is called 1 *mill.* Hence,

1 tenth of 1 dollar is 1 dime, which is written $.1 or $.10.

1 tenth of 1 dime, or 1 hundredth of a dollar, is 1 cent, which is written $.01.

1 tenth of 1 cent, or 1 thousandth of a dollar, is 1 mill, which is written $.001.

When the dollar mark ($) is used in writing any sum of money, the *Decimal Point* — which is a period or point (.) — must always be placed before the cents. Thus, $17.42; $.37.

From the preceding illustrations we see, that 1 tenth of a 1 is 1 tenth, and is written .1; 1 tenth of .1 is 1 hundredth, and is written .01; and 1 tenth of .01 is 1 thousandth, and is written .001. That is

The first place at the right of the decimal point is the place of tenths, the second place is the place of hundredths, and the third place is the place of thousandths.

The first two figures at the right of the decimal point express cents, and the third figure expresses mills. Thus,

| | | |
|---|---|---|
| $.03 | expresses | 3 cents. |
| $.87 | " | 87 cents. |
| $7.08 | " | 7 dollars 8 cents. |
| $3.54 | " | 3 dollars 54 cents. |
| $.007 | " | 7 mills. |
| $.092 | " | 9 cents 2 mills. |
| $.625 | " | 62 cents 5 mills. |
| $14.706 | " | 14 dollars 70 cents 6 mills. |

1. How many mills are there in 4 cents?
2. How many mills in 10 cents?
3. How many mills are a half-cent?
4. 5 dimes are how many cents?
5. 3 half-dimes are how many cents?
6. How many dollars are 6 eagles?
7. 3 dollars are how many cents?
8. 10 dollars are how many cents?
9. 5 half-dollars are how many cents?
10. Agnes has 3 dimes and a half-dime. How many cents has she?
11. Janet gave a half-dollar, 2 dimes, and a half-dime for a grammar. How many cents did it cost?
12. How many dollars are 5 eagles and a half-eagle?
13. How many dollars are a double eagle and 8 eagles?
14. A man was paid a 50-dollar piece for making cigars, at a cent apiece. How many cigars did he make?
15. How many cents are an eagle and a dollar worth?
16. 30 mills are how many cents?
17. 87 mills are how many cents and mills? *Methods, p. 176.*
18. 100 mills are how many cents?

19. 45 mills are how many cents?
20. 60 cents are how many dimes?
21. How many dimes and cents are 36 cents?
22. How many eagles are 40 dollars?
23. How many eagles and dollars are 96 dollars?
24. How many picture books, at a dime apiece, can be bought for 50 cents?
25. If 1 ton of plaster costs a half-eagle, how many tons can be bought for $70?
26. A merchant exchanged $120 for its value in gold eagles. How many eagles did he receive?
27. At a dime apiece, how many spools of thread can be bought for 80 cents?
28. 500 cents are how many dollars?
29. 1,000 cents are how many dollars? How many eagles?
30. How many pairs of slippers, at $1 a pair, can I buy for 600 cents?
31. How many bushels of apples, at $1 a bushel, can be bought for 900 cents?
32. How many cents are 5 dollars and 60 cents?
33. How many cents are 8 dollars and 34 cents?
34. How many cents are 15 dollars and 9 cents?
35. A stationer received 7 dollars 58 cents for slate pencils, at 1 cent apiece. How many pencils did he sell?
36. A boy who peddled apples at 1 cent apiece, took in 5 dollars 4 cents in one week. How many apples did he sell?
37. How many sheets of paper, at 1 cent a sheet, can be bought for 10 dollars 75 cents?
38. 225 cents are how many dollars and cents?
39. 508 cents are how many dollars and cents?
40. How many pocket-knives can I buy with 724 cents, at $1 apiece, and how many cents will I have left?

## SECTION II.

### *COMPUTATIONS.*

1. NEWTON paid 1 dollar 25 cents for a pair of birds, and 1 dollar 50 cents for a cage. How much did he pay out?

2. A gardener gave 1 dollar 50 cents for a spade, 88 cents for a hoe, and 1 dollar 25 cents for a rake. How much did he give for all? *Methods, page 176.*

3. I paid $3.50 for a coat, $1.75 for a hat, and $5.50 for a pair of shoes. How much did they all cost me?

4. Rufus gave $.80 for a reader, $1.40 for an arithmetic and slate, and $2.25 for a geography. How much did his school books cost him?

5. How much will be the cost of a pair of scissors at 45 cents, a penknife at 81 cents, a work basket at 94 cents, and a thimble at 50 cents?

6. I paid 19 dollars 67 cents railroad fare, 7 dollars 11 cents hotel bills, and 3 dollars 60 cents for horse hire. How much did my journey cost me?

7. Calvin having 5 dollars 84 cents, bought a ball and bat for 1 dollar 56 cents. How much money had he left? *Methods, page 176.*

8. Edith took 1 dollar 25 cents, with which to buy some silk for an apron; but it cost only 95 cents. How much money did she bring home?

9. I owe 7 dollars 48 cents, and I have 5 dollars 75 cents. If I pay all the money I have, how much will I then owe?

10. Lilian gave a $5 bill in payment for a pair of shoes that cost $3.75. How much change did she receive?

11. If I have $6.30, how much more money must I have, to buy a watch worth $25?

12. A merchant bought broadcloth at $3.75 a yard, and sold it at $5.25. How much did he gain on a yard?

13. How much will 9 pounds of crushed sugar cost, at 17 cents a pound?

14. At 22 cents a pound, how much will 5 pounds of raisins cost?

15. How much will a laborer earn in 6 days, at 1 dollar 75 cents a day? *Methods, page 176.*

16. How much will 8 fruit-knives cost, at 3 dollars 25 cents apiece?

17. What will be the cost of 10 paper-weights, at $.88 apiece?

18. How much will 7 tons of coal cost, at $6.34 a ton?

19. If 8 pounds of dried plums cost 1 dollar 28 cents, what is the cost of 1 pound?

20. If 5 yards of delaine cost $1.85, how much will 1 yard cost? *Methods, page 177.*

21. At what price per basket will 4 baskets of peaches bring $3.76?

22. A gardener sold 7 bushels of sweet-potatoes for 9 dollars 80 cents. What is the price per bushel?

23. How much must I earn each day, to earn $36.50 in 10 days?

24. If 8 reams of paper cost $34, what is the price per ream?

25. Carrie paid 90 cents for needles, at 6 cents a paper. How many papers did she buy?

26. How many pounds of rice, at 8 cents a pound, can be bought for 2 dollars 24 cents? *Methods, page 177.*

27. A laborer received 3 dollars, for threshing oats at 4 cents a bushel. How many bushels did he thresh?

28. In one month a young man paid out $6.50 for cigars, at 10 cents apiece. How many cigars did he buy?

29. At 9 cents a box, how many boxes of blacking can be bought for $4.95?

30. Amelia had 1 dollar 42 cents, but she has paid out 56 cents for ribbon, and 37 cents for buttons. How much money has she left?

31. Hugh had 84 cents, his mother gave him 68 cents, and he gave 96 cents for a hatchet. How much money had he then?

32. A gentleman bought a pair of gloves for $.63, and an umbrella for $1.75, and gave the shop-keeper a half-eagle in payment. How much money did he receive in return?

33. Luella bought 8 yards of cambric, at 23 cents a yard, and 30 cents' worth of machine twist. How much did her purchases amount to?

34. How much will be the cost of a jar of 10 pounds of butter, at 28 cents a pound, and 56 cents for the jar?

35. I bought a pound of tea for $1.62, and 7 pounds of lard at 17 cents a pound. How much did my purchases cost me?

36. How much will you have to pay for 9 quires of letter-paper at 38 cents a quire, and a quart bottle of ink at 75 cents?

37. Jason has $1.38, and he wishes to buy 6 pine-apples, which cost $.25 apiece. How much more money must he have, to make the purchase?

38. A man bought 8 pounds of stove pipe, at 19 cents a pound, and paid 95 cents. How much did he then owe upon it?

39. How much money must be given, with a keg of oysters worth $1.25, in exchange for a turkey which weighs 9 pounds, at $.26 a pound?

40. A lady had 27 quarts of currants, and she paid $2.48 for more at $.08 a quart. How many quarts of currants had she then?

41. Clement had 96 cents, and Amos 69 cents, and they spent the whole of their money for 5 pounds of almonds. How much did the almonds cost per pound?

42. A grocer paid 6 dollars 3 cents for 9 bushels of tomatoes, and sold them at 85 cents a bushel. How much did he gain on a bushel?

43. Viola paid $.92 for pears, at $.04 apiece. After giving 9 of them to Louise, how many had she left?

44. A man who had $12, gave all but $2.10 of it for 6 chairs. How much were the chairs apiece?

45. If 3 gallons of oil cost $3.39, how much will 7 gallons cost?

46. If 10 bushels of corn cost $8.40, how much will 6 bushels cost?

47. If the pasturage of a cow for 7 weeks costs $6.16, how much will her pasturage cost for 9 weeks?

48. A paid $28 for 8 sheep, and B bought 5 at the same price. How much did B pay for his?

49. If 4 men can earn $42 in 6 days, how much can 7 men earn in 10 days?

# CHAPTER IV.

## COMPOUND NUMBERS.

### SECTION I.

#### *DEFINITIONS.*

We determine the quantity of all articles bought and sold, by either *measuring*, *weighing*, or *counting* them.

*Denomination* is the name of the unit of a concrete number; as, gallon, foot, pound, hour, dollar.

A *Denominate Number* is a number applied to a denomination; as, 9 quarts, 4 feet, $7.

A *Simple Number* is an abstract number, as, 6, 43, 915; or a concrete number of but one denomination, as, 78 men, 324 miles.

A *Compound Number* is a number expressed in two or more denominations; as, 4 pounds 10 ounces, 15 gallons 3 quarts 1 pint.

*Higher Denominations* are those which express the greater amount or quantity. And

*Lower Denominations* are those which express the less amount or quantity. Thus, a peck is a higher denomination than a quart, and a lower denomination than a bushel.

A *Denominate Unit* is *one* of any denomination; as, 1 pound, 1 foot, 1 quart, 1 dozen.

In computations in Compound Numbers, it is often necessary to change units of higher denominations to those of lower, as gallons to quarts or pints; or units of lower denominations to those of higher, as feet to rods or miles.

*Reductions* are processes of changing numbers from one denomination to another without changing values. They are of two kinds, *Reduction Descending* and *Reduction Ascending*.

*Reduction Descending* is the process of changing numbers from higher to lower denominations; and

*Reduction Ascending* is the process of changing numbers from lower to higher denominations.

## SECTION II.

### *REDUCTIONS.*

### 13. Liquid Measure.

In measuring oil, molasses, syrups, wines, milk, and other liquids,

| | | | | |
|---|---|---|---|---|
| 4 gi. (gills) | are 1 pt. | (pint.) | 1 gal. | is 4 qt. |
| 2 pt. | " 1 qt. | (quart.) | 1 qt. | " 2 pt. |
| 4 qt. | " 1 gal. | (gallon.) | 1 pt. | " 4 gi. |

(See Manual, page 173.)

1. 10 gallons are how many quarts? How many pints?
2. Change 7 quarts to gills. *Methods, page 177.*
3. If a pastry-cook uses 1 gill of wine every day, in how many days will she use a gallon?
4. In how many days would she use 4 gal. 1 qt. 1 pt. 3 gi.? *Methods, page 177.*
5. How many pint bottles will be required to hold 3 gal. 2 qt. of tomato catsup?
6. A milk-man sold 8 gal. 2 qt. of milk, at 8 cents a quart. How much did it amount to?
7. How many gallons are 32 quarts?

8. If you buy 1 pint of milk a day, how many quarts will you buy in 60 days? How many gallons?

9. A druggist put up 180 gill bottles of castor-oil. How many gallons of oil did he use? *Methods, p. 177.*

10. Change 103 pints to gallons.

11. Reduce 217 pints to gallons.

## 14.

### Dry Measure.

In measuring grain, seeds, fruits, berries, several kinds of vegetables, lime, charcoal, and some other articles,

| | |
|---|---|
| 2 pt. are 1 qt. | 1 bu. is 4 pk. |
| 8 qt. " 1 pk. (peck.) | 1 pk. " 8 qt. |
| 4 pk. " 1 bu. (bushel.) | 1 qt. " 2 pt. |

6 quarts dry measure are equal to nearly 7 quarts liquid measure.

12. To how many persons will a grocer sell 8 bushels of apples, if he sells 1 peck to each person?

13. 3 pecks are how many pints?

14. How many quart boxes will 2 pk. 5 qt. of strawberries fill?

15. How many pints are 2 bu. 1 pk. 3 qt.?

*16.* A boy gathered 3 bushels 4 quarts of chestnuts. How many times would they fill a pint measure?

*17.* How many half-pecks are 9 bushels 2 pecks?

*18.* If tomatoes sell at 3 cents a quart, how much is a bushel worth?

*19.* Reduce 320 pints to bushels.

*20.* A grocer sold 198 pecks of charcoal in one week. How many bushels did he sell?

*21.* 642 pints are how many pecks? How many bushels?

*22.* If a boy sells 10 quarts of pea-nuts a day, how many bushels will he sell in 6 days?

*23.* Reduce 59 quarts to higher denominations.

*24.* A man picked 305 pints of cherries from the trees in his garden. How many bushels did he pick?

## 15. Linear Measure.

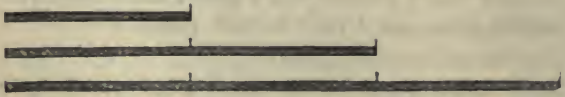
In measuring distances, and the dimensions of things,—as, their length, width, thickness, height, and depth,—

| | | | | | |
|---|---|---|---|---|---|
| 12 | in. (inches) | are 1 ft. | (foot.) | 1 mi. | is 320 rd. |
| 3 | ft. | " 1 yd. | (yard.) | 1 rd. | " 5.5 or 5½ yd. |
| 5.5 or 5½ | yd. | " 1 rd. | (rod.) | 1 yd. | " 3 ft. |
| 320 | rd. | " 1 mi. | (mile.) | 1 ft. | " 12 inches. |

And, in measuring goods sold by the yard in length,

| | | | |
|---|---|---|---|
| 4.5 or 4½ | in. | are 1 eighth. | 1 yd. is 4 qr. |
| 2 eighths, or 9 | in. | " 1 qr. | 1 qr. " 9 in. |
| 4 | qr. | " 1 yd. | 1 eighth " 4.5 or 4½ in. |

The first of these lines is 1 inch long, the second is 2 inches, and the third is 3 inches.



*25.* In 9 feet are how many inches?

*26.* How many rods are 3 miles?

27. Change 6 yards to feet, and 4 yd. 2 ft. to inches.

28. In 43 inches are how many feet and inches?

29. 136 inches are how many feet?

30. Change 92 inches to yards.

31. How many steps, each 2 ft. long, will James take in walking 110 yards?

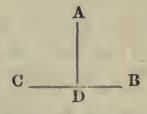
32. If a man travels 50 rods in 5 minutes, how long will it take him to travel a mile?

33. 35 quarters are how many yards?

34. Change 3 yards 2 quarters to feet, and also to inches.

35. 205 inches are how many yards?

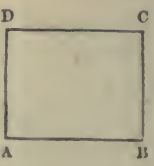
## 16. Square Measure.




An *Angle* is the difference of direction of two lines that meet in a point. Thus, A D C is an angle.

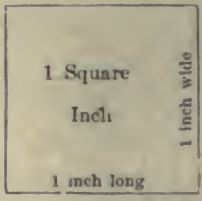
A *Right-Angle* is one formed by two lines perpendicular to each other. Thus, the angles A D B and A D C are right angles.

A *Surface* is a figure that has length and breadth.




A *Rectangle* is a four-sided figure having only right angles. Thus, the surface A B C D is a rectangle.

A *Square* is a figure bounded by four equal sides, and having four right angles.




A *Square Inch* is a square 1 inch long and 1 inch wide;

A *Square Foot* is a square 1 foot long and 1 foot wide;

A *Square Rod* is a square 1 rod long and 1 rod wide; and

A *Square Mile* is a square 1 mile long and 1 mile wide.

*36.* A blackboard is 4 feet wide and 10 feet long. How many square feet of surface has it? *Methods, 177.*

*37.* How many square rods are there in a field 11 rods square?

*38.* How many panes of glass are there in a window that is 4 panes in width, and 6 panes in height?

*39.* What is the number of square inches on the surface of a mirror 10 inches long and 8 inches wide?

*40.* How many square yards of carpeting will cover the floor of a room 6 yards long and 5 yards wide?

*41.* The title cover of this book was engraved on a block of box-wood 4 by 6 inches. How much did the wood cost, at 5 cents per square inch?

*42.* One side of a slate that is 10 inches long, measures 80 square inches. How wide is it? *Methods, 177.*

*43.* In drawing a map, Julia used a piece of drawing paper 9 inches long, and which contained 63 square inches. How many inches wide was the paper?

*44.* The floor of a bedroom 9 feet wide contains 108 square feet. What is the length of the room?

*45.* A school yard of 120 square rods is 8 rods wide. How long is it?

*46.* A certain town is 7 miles long, and it contains 28 square miles. What is its width?

In computing the area of land, flooring, plastering, and other surfaces,

| | | | |
|---|---|---|---|
| 144 sq. in. (square in.) | are 1 sq. ft. | 1 sq. mi. | is 640 A. |
| 9 sq. ft. | " 1 sq. yd. | 1 A. | " 160 sq. rd. |
| 30.25 or 30¼ sq. yd. | " 1 sq. rd. | 1 sq. rd. | " 30.25 or 30¼ sq. yd. |
| 160 sq. rd. | " 1 A. (acre.) | 1 sq. yd. | " 9 sq. ft. |
| 640 A. | " 1 sq. mi. | 1 sq. ft. | " 144 sq. in. |

*47.* 3 square feet are how many square inches?

*48.* How many square feet of paving stone are there in a flag-stone that measures 3 sq. yd. 4 sq. ft.?

*49.* How many square rods are 1 A. 40 sq. rd. of land?

*50.* How many acres are 640 square rods?

*51.* 36 square feet are how many square yards?

*52.* Reduce 121 sq. yd. to square feet.

*53.* How many square inches are there in a board 15 feet long and 10 inches wide?

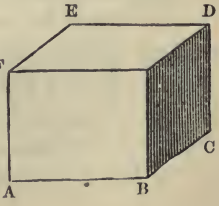
*54.* How many square feet are there on a roof that is 40 feet long and 20 feet wide on each of the two sides?

*55.* A field 16 by 20 rods contains how many acres?

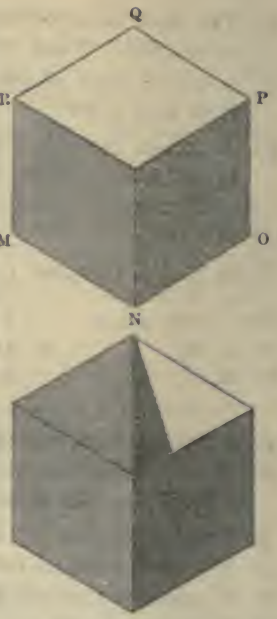
## 17. Cubic Measure.

A *Solid* or *Body* is a figure that has length, breadth, and thickness.

A *Rectangular Solid* is a body that has six sides or surfaces, each



of which is a rectangle. Thus, the solids A B C D E F G and M N O P Q R S are rectangular solids.




A *Cube* is a body that has six equal square sides or surfaces.

A *Cubic Inch* is any body or portion of space 1 inch long, 1 inch wide, and 1 inch thick.

A *Cubic Foot* has six equal surfaces each 1 foot square; and

A *Cubic Yard* has six equal surfaces each 1 yard square.

*56.* How many cubic inches are there in a block 12 in. long, 6 in. wide, and 3 in. thick? *Methods, page 177.*

*57.* What is the solidity of a block of marble 8 feet long, 7 feet wide, and 3 feet thick?

*58.* How many blocks, each containing 1 cubic foot, will be equal to a block 7 feet long, 5 feet wide, and 4 feet thick?

*59.* A common brick is 2 by 4 by 8 inches. What are its solid contents?

*60.* How long must a box be, that is 2 feet wide and 3 feet thick, to contain 72 cu. ft.? *Methods, page 177.*

*61.* The capacity of a rectangular cistern 6 ft. wide and 5 ft. deep, is 270 cu. ft. What is its length?

*62.* In digging a cellar 2 yards deep and 15 yards long, 270 cubic yards of earth were removed. How many yards wide was the cellar?

In computing the solidity of timber, stone, portions of earth, and many other articles, and in estimating the capacity of bins, boxes, casks, etc.,

| | | | |
|---|---|---|---|
| 1,728 cu. in. (cubic in.) | are | 1 cu. ft. | 1 cu. yd. is 27 cu. ft. |
| 16.5 or $16\frac{1}{2}$ cu. ft. | " | 1 perch. | 1 perch " { 16.5 or $16\frac{1}{2}$ cu. ft. |
| 27 cu. ft. | " | 1 cu. yd. | 1 cu. ft. " 1,728 cu. in. |

*63.* In 5 cu. yd. are how many cubic feet?

*64.* How many cubic yards in 81 cu. ft.?

*65.* How many cubic inches in 1 cu. ft. 7 cu. in.?

*66.* How many cubic feet in 2 cu. yd. 8 cu. ft.?

*67.* What will be the cost of a piece of timber 1 foot square and 20 feet long, if 4 cubic feet cost $1?

*68.* How many cubic yards are 87 cubic feet?

*69.* How many loads of earth of one cubic yard each, must be removed, in digging a cellar 21 feet long, 18 feet wide, and 6 feet deep?

*70.* How many cubic feet are there in a stick of timber 16 inches wide, 9 inches thick, and 13 feet long?

*71.* How many cubic blocks, measuring 2 inches on a side, can be put into a box whose inside measurements are 4, 8, and 10 inches?

*72.* How thick is a block of stone that is 15 ft. long and 4 ft. wide, and whose contents are 180 cu. ft.?

## 18. Wood Measure.

In measuring wood, and also rough stone when it is sold by the cord,

| | | | |
|---|---|---|---|
| 16 cu. ft. | are | 1 cd. ft. (cord ft.) | 1 cd. is { 128 cu. ft., or 8 cd. ft. |
| 8 cd. ft., or 128 cu. ft. | " | 1 cd. | 1 cd. ft. " 16 cu. ft. |

Surveyors of wood commonly call the cord foot *A Foot of Wood.*

73. How many cubic feet are 5 cord feet?

74. In 7 cords of wood are how many cord feet?

75. How many cord feet are 96 cubic feet?

76. In 47 cord feet are how many cords?

77. A pile of stone 4 feet wide, and 4 feet high, contains 1 cord. What is its length?

78. How many cords of wood are there in a pile 16 feet long, 5 feet wide, and 6 feet high?

79. What cost 5 cords of wood, if 4 cord feet cost 3 dollars?

80. How many cord feet of wood in 3 loads, each 8 feet long, 3 feet wide, and 4 feet high? How many cords?

81. How many cords of wood are 1,280 cubic feet?

82. A pile of tan bark 64 feet long, 4 feet wide, and 6 feet high contains how many cords?

## 19. Weight.

In weighing most kinds of produce, provisions, groceries, metals, coal, and many other articles,

| | | | |
|---|---|---|---|
| 16 oz. (ounces) | are 1 lb. (pound.) | 1 T. | is 20 cwt. |
| 100 lb. | " 1 cwt. (hundred-weight.) | 1 cwt. | " 100 lb. |
| 20 cwt. | " 1 T. (ton.) | 1 lb. | " 16 oz. |

A barrel of flour weighs 196 lb., and a barrel of pork, beef, or fish 200 lb.

*83.* How much will 1 pound of indigo cost, at 20 cents an ounce? How much will 7 pounds cost?

*84.* At 10 cents an ounce, how much will 3 lb. 8 oz. of nutmegs cost?

*85.* How many pounds of cloves can be bought for 3 dollars 20 cents, at 10 cents an ounce?

*86.* 95 ounces are how many pounds?

*87.* Reduce 250 pounds to hundred-weight.

*88.* What will 7 pounds 6 ounces of meat cost, at 16 cents a pound?

*89.* How much will 50 pounds of flour cost, at 5 dollars a hundred-weight?

*90.* What will 2 lb. 11 oz. of cheese cost, at $.16 a pound?

*91.* How much will 2 lb. 5 oz. of butter cost, at $.32 a pound?

*92.* What will 5 T. 5 cwt. of coal cost, at $10 a ton?

*93.* How much will a sack of flour weighing 49 pounds, cost, when flour is worth 10 dollars a barrel?

*94.* When pork sells for $32 a barrel, how much will 25 pounds cost?

*95.* What will 2 T. 1 cwt. of hay cost, at $20 a ton?

*96.* When flour sells at 6 cents a pound, how much does a barrel sell for?

*97.* At $40 for 5 cwt. of iron castings, how much will 1 ton cost?

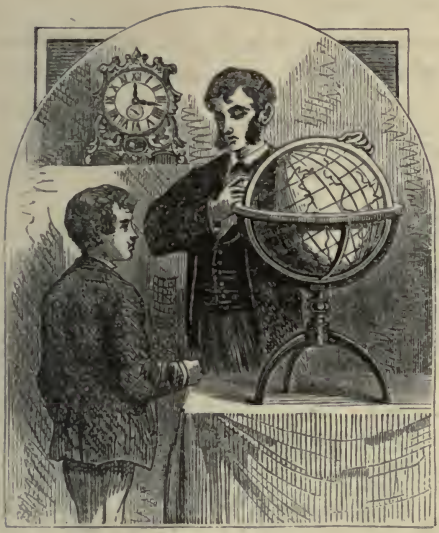
## 20. Time.

In expressing portions of time or duration of different lengths,

60 sec. (seconds) are 1 min. (minute.)

| | | | | | |
|---|---|---|---|---|---|
| 60 min. | are | 1 h. (hour.) | 1 century | is | 100 yr. |
| 24 h. | " | 1 da. (day.) | 1 leap-year | " | 52 wk. 2 da., or 366 da. |
| 7 da. | " | 1 wk. (week.) | | | |
| 52 wk. 1 da., or 365 da. | " | 1 common yr. (year.) | 1 common yr. | " | 52 wk. 1 da., or 365 da. |
| 52 wk. 2 da., or 366 da. | " | 1 leap-yr. | 1 wk. | " | 7 da. |
| 100 yr. | " | 1 century. | 1 da. | " | 24 h. |
| | | | 1 h. | " | 60 min. |
| | | | 1 min. | " | 60 sec. |

(See Manual, page 173.)



Every fourth year from the beginning of a century is a leap-year.

The year is divided into 12 calendar months, and these are arranged in 4 seasons of 3 months each, as shown in the diagram on the next page.

February has 28 days in a common year, and 29 in a leap-year.

In most business transactions, 30 days are regarded as a month.

*98.* In 3 hours are how many minutes?

*99.* Change 5 minutes 20 seconds to seconds.

*100.* How many days are 72 hours? 100 hours?

*101.* How many weeks are 17 days?

*102.* How many weeks are there in July, August, and September?

*103.* If a man walks $\frac{1}{2}$ mile in 10 minutes, how long will it take him to walk 12 miles?

*104.* How many days are there from the 7th of May to the 4th of July?

*105.* If a man earns $2 in 6 hours, how much will he earn in 12 days of 10 working hours each?

*106.* When the sun sets at 4 h. 50 min. P. M., what is the length of the day?

*107.* When the sun rises at 5 h. 15 min. A. M., what is the length of the night? (See Manual, page 173.)

*108.* How many weeks in 1 year and 17 weeks? How many days?

*109.* If a man earns $12 a week, and pays $12 a month for his board, how many dollars will he save in 10 months, working four weeks each month?

*110.* How many days in the winter season? In the spring? In summer? In autumn?

### 21. Paper and Counting.

In the paper trade,

| | |
|---|---|
| 24 sheets are 1 quire. | 1 ream is 20 quires. |
| 20 quires " 1 ream. | 1 quire " 24 sheets. |

In counting several classes of articles for market purposes,

| | |
|---|---|
| 12 things are 1 doz. (dozen.) | 1 gro. is 12 doz. |
| 12 doz. " 1 gro. (gross.) | 1 doz. " 12 things. |

Two things of a kind are often called a *Pair;* six things, a *Set;* and twenty things, a *Score.*

*111.* A market woman sold 67 cucumbers. How many dozen did she sell?

*112.* If a yoke of oxen sells for 180 dollars, how much is one of them worth?

*113.* How many are 3 score and 10 years?

*114.* What is the cost of 6 quires of paper, at $4 a ream?

*115.* A grocer, in one day, took in 8 doz. and 10 eggs. How many eggs did he take in?

*116.* What cost two gross of copy-books, at $.10 apiece?

*117.* A silversmith sold 42 tea-spoons in one week. How many sets did he sell?

*118.* A shop-keeper sold, in one week, 2 gross and 6 fancy buttons, at ten cents a dozen. How much did he receive for them?

*119.* A stationer paid 2 dollars a ream for paper, and sold it for 18 cents a quire. How much was his gain on one ream?

*120.* A grocer bought 3 pounds of nutmegs, at 128 cents a pound, and sold them at 10 cents an ounce. How much was his gain?

*121.* A market woman who took 5 dozen of eggs to market, broke 3 of them, and sold the others at 24 cents a dozen. How much did she receive?

## SECTION III.

### *ADDITION.*

1. Add 7 bushels 1 peck, and 5 bushels 2 pecks.
2. What is the sum of 2 pecks 5 quarts, and 1 peck 7 quarts?
3. How many sq. yd. in the sum of 4, 6, 7, 3, 5, and 2 sq. ft.?
4. A grocer sold, on Monday, 5 gal. 2 qt. of molasses; on Tuesday, 3 gal. 1 qt.; and on Wednesday, 4 gal. 2 qt. How much did he sell? *Methods, page 178.*
5. One week a druggist used 2 gal. 1 qt. of alcohol, and the next week 3 gal. 3 qt. 1 pt. How much did he use in the 2 weeks?
6. One month a tailor used 2 gross 5 dozen buttons, and in another month 3 gross 8 dozen. How many buttons did he use in the 2 months?
7. How many acres are there in 2 fields, one containing 9 A. 70 sq. rd., and the other 7 A. 90 sq. rd.?
8. A farmer sowed 2 bu. 4 qt. of clover seed, and 1 bu. 3 pk. 6 qt. of timothy seed. How much seed did he sow of both kinds?
9. The fore quarters of a lamb weighed 7 lb. 9 oz. each, and the hind quarters 8 lb. 11 oz. each. How much did the lamb weigh?
10. What is the sum of 2 yd. 2 ft. 9 in., and 3 yd. 1 ft. 8 in.?
11. If a laborer removes 60 cu. yd. 13 cu. ft. in digging a cellar, and 11 cu. yd. 19 cu. ft. in digging the drain, how much earth does he remove?
12. If a fruit dealer sells 5 bu. 3 pk. of peaches, 2 bu. 1 pk. 6 qt. of plums, and 3 bu. 2 pk. 2 qt. of pears, how much fruit does he sell of the three kinds?
13. A coal dealer delivered 13 T. 11 cwt. to A, 9 T. 15 cwt. to B, and 7 T. 4 cwt. to C. How much coal did he sell to the three men?

## SECTION IV.

### *SUBTRACTION.*

1. From 9 bushels 3 pecks subtract 5 bushels 2 pecks.
2. A grocer bought 12 lb. 6 oz. of Castile soap, and sold 5 lb. 8 oz. How much had he left? *Methods, 178.*
3. From ½ bushel take ¼ peck.
4. From 6 feet 5 inches take 4 feet 7 inches.
5. On a lot 30 ft. 6 in. wide, stands a house 19 ft. 10 in. wide. How much wider is the lot than the house?
6. From a cask containing 16 gal. 2 qt. of vinegar, a man drew 8 gal. 3 qt. How much vinegar remained in the cask?
7. A farmer sowed 20 bu. 2 pk. of wheat, and 11 bu. 3 pk. of buckwheat. How much more wheat than buckwheat did he sow?
8. A man removed 42 cu. yd. 10 cu. ft. of earth in digging a cellar, and 7 cu. yd. 19 cu. ft. in digging the drain. How much more earth did he remove from the cellar than from the drain?
9. If it takes 9 h. to go from Albany to New York by steam-boat, and 5 h. 15 min. by railroad, how much longer does it take to go by boat than by cars?
10. When the sun rises at 5 o'clock and 40 minutes, what is the length of the forenoon?
11. How much of my 9 weeks' vacation is to come, when 5 weeks 4 days of it have passed?
12. From a piece of land containing 7 acres, I sold 3 acres 75 square rods. How much land had I left?
13. I bought a crock of butter weighing 27 lb. 9 oz., but the crock alone weighed 7 lb. 12 oz. How much did the butter weigh?

## SECTION V.

### *MULTIPLICATION.*

1. How much tea will it take to fill 5 canisters, each holding 2 lb. 8 oz.? *Methods, page 178.*
2. If a horse eats 2 bu. 2 pk. 4 qt. of oats in 1 week, how much will he eat in 4 weeks?
3. A painter used 2 qt. 1 pt. of turpentine every day, for 9 days. How much turpentine did he use?
4. If it takes 7 yd. 2 qr. of cassimere to make one suit of clothes, how much will it take to make 2 suits?
5. If 1 cow eat 1 ton 6 hundred-weight of hay in the winter, how much will 5 cows eat?
6. How much paper will a lawyer use in a year, at the rate of 3 quires 7 sheets per month?
7. Oliver is 7 years 9 months old, and his mother is 6 times as old. How old is his mother?
8. How much wheat will be required to seed 3 acres, allowing 1 bu. 2 pk. 4 qt. to the acre?
9. If a railroad train runs 15 miles 80 rods in one hour, how far will it move in 4 hours?
10. William's fish line is 10 yards 2 feet long, and his kite string is 10 times as long. How long is his kite string?
11. How many steel pens will be used in a Commercial College in 8 months, if 3 gross 7 dozen are used monthly?
12. If a farmer can plow 2 A. 40 sq. rd. of land in 1 day, how much can he plow in 6 days?
13. How much wood is there in 3 piles, each pile containing 7 cords 12 cubic feet?

14. If a family use 2 dozen 8 eggs in a week, how many will they use in 4 weeks, at the same rate?
15. If 60 cu. yd. 15 cu. ft. of earth are removed from each of two cellars, how much earth is removed from both?
16. If a painter uses 2 gal. 2 qt. 1 pt. of linseed-oil in painting 1 wagon, how much will he use in painting 5 wagons?
17. What is the weight of 8 loads of hay, each weighing 1 T. 250 lb.?

## SECTION VI.

### *DIVISION.*

1. If a steam-boat runs 22 mi. 40 rd. in 2 hours, how far does she run in 1 hour?
2. If it takes 13 bu. 3 pk. of oats to seed 5 acres, how much does it take for 1 acre? *Methods, page 178.*
3. If it takes 5 yards of cloth for one military suit, how many suits can be made from a piece containing 32 yards, and what remnant will be left?
4. If 7 men can mow 21 acres 35 square rods of grass in a day, how much can 1 man mow?
5. If a cooper can make 4 barrels in 5 hours, how long will it take him to make 1 barrel?
6. If 3 cheeses weigh 96 lb. 12 oz., what is their average weight?
7. A grocer sold a barrel of flour to 4 persons, who shared it equally. How many pounds did each person have?
8. If a man lays 25 rd. 15 ft. of stone-wall in 5 days, how much does he lay in 1 day?

9. 3 times Josiah's age is 42 yr. 9 mo. 24 da. What is his age?

10. A lady put 8 qt. 1 pt. 1 gi. of currant wine into 3 bottles. How much did she put into each bottle?

11. A man killed 7 sheep, and their united weight was 280 lb. 14 oz. What was their average weight?

12. 5 boys gathered 2 pk. 4 qt. of chestnuts, and shared them equally. How much was each boy's share?

13. If one apple barrel holds 2 bu. 3 pk., how many barrels will be required to hold 11 bu. of apples?

14. A housekeeper made 3 gal. 1 qt. 1 pt. 2 gi. of currant jelly, and put it up in 5 jars. How much did each jar contain?

15. How many writing-books can be made from 1 quire of foolscap paper, allowing 3 sheets for each book? How many can be made from 1 ream?

16. If a railroad train runs 80 miles in 4 hours, in how many minutes will it run 1 mile?

17. A man had a pile of wood containing 7 cords 4 cord feet, and he drew it in 5 loads. How much did he draw at a load?

18. A butcher killed 4 hogs, whose united weight was 14 cwt. 40 lb. What was their average weight?

19. A stationer sold 21 gross 7 dozen writing-books, in 6 days. What were the average daily sales?

20. A man cut 4 T. 10 cwt. of hay from 3 acres. What was the average per acre?

21. A tinsmith used 3 bu. 3 pk. of charcoal in 8 days. What was the average amount used per day?

## SECTION VII.

### *REVIEW PROBLEMS.*

1. How many pint bottles will be required to contain 3 gal. 3 qt. of strawberry wine?
2. If 3 pints of blackberries cost 21 cents, how much will a bushel cost?
3. Reduce 33 yards to rods.
4. At 2 cents an inch, how much will 2 yards of silver wire cost?
5. A man paid 960 dollars for land, at one dollar a square rod. How many acres did he buy?
6. A stone-mason laid up 4 perch of stone in one side of a cellar wall. How many cubic feet did he use?
7. If 4 cord feet, or 1 half-cord, of wood cost 2 dollars, what is the cost of 3 cords?
8. A grocer sold 5 quarts of cranberries to one person, 7 quarts to another, and 1 peck 4 quarts to a third. How many pecks did he sell?
9. A lawyer used 1 ream of legal-cap paper in 10 weeks. How many sheets did he use in a day, on an average?
10. If 3 eggs cost 5 cents, how much will 9 dozen eggs cost?
11. Which contains the more land, a field 12 rods square, or a field 9 by 16 rods?
12. From a pile of wood containing 7 cords, a man sold 4 loads, each 12 feet long, 4 feet wide, and 4 feet high. How much remained?
13. If you can read 5 pages in 10 minutes, in how many hours can you read a book of 150 pages?

14. If a family use 5 lb. 9 oz. of butter in 1 week, how much will they use in 6 weeks?

15. A druggist has 13 gal. 3 qt. of alcohol. If he sells, on an average, 2 qt. 1 pt. a day, for 6 days, how much will he have left?

16. Anson has a quart measure and a pint measure. How many times can he fill each of them, separately, from 1 bushel of beans?

17. When peas are worth $1.60 a bushel, what will 4 quarts cost?

18. How much clover seed, at 1 pk. 5 qt. per acre, will be required to seed a field of 8 acres?

19. How many rods long must a field be, that is 20 rods wide, to contain 3 acres?

20. The floor of a bedroom 8 feet wide is covered by 8 square yards of carpeting. How many feet long is the room?

21. How many blocks 2 inches square can be cut from a piece of board 6 by 8 inches?

22. How many cords of wood are there in a pile 12 feet long, 4 feet wide, and 8 feet high?

23. How much will 10 lb. 15 oz. of ham cost, at 32 cents a pound?

24. How many pounds of ground pepper will be required to fill 100 boxes, each box holding 4 ounces?

25. A grocer sold, to 5 customers, 6 oz., 1 lb. 8 oz., 12 oz., 8 oz., and 1 lb. 4 oz. of allspice. How much did he sell in all?

26. How many barrels of flour are there in 8 sacks, each containing 49 pounds?

27. If a family use 10 pounds of pork per week, how many weeks will a barrel last them?

28. A grocer bought a barrel of pork, and sold, to customers, 5 lb., 8 lb., 9 lb., 4 lb., 6 lb., 13 lb., 44 lb., and 10 lb. How many pounds were then left in the barrel?

29. At $60 a ton, how much will 14 hundred-weight of railroad iron cost?

30. A farmer bought 2 T. 12 cwt. of plaster. He sowed 1 T. 15 cwt. on his wheat field, and the balance on his clover lot. How much did he sow on the clover?

31. A stationer bought a gross of pens for 72 cents, and sold them at 10 cents a dozen. How much did he gain on 1 dozen? How much on the gross?

32. At $.04 a sheet, how many quires of gilt paper can be bought for $1.44?

33. How long is a fence which incloses a piece of land 60 rods long and 40 rods wide?

34. In a year how many days are there in the months that have 31 days each?

35. A paper mill that runs 12 hours per day, turns out 72 reams of print paper daily. How many reams is that per hour? How many quires per minute?

36. How many square inches are there on one side of a common brick? On both sides? On both edges? On both ends?

37. A grocer having 8 lb. of cinnamon, sold to customers 4 oz., 12 oz., 6 oz., and 8 oz. How much had he left?

38. How many pint and quart bottles, of each an equal number, can be filled from 19 gal. 3 qt. 1 pt. of currant wine?

# CHAPTER V.

# FRACTIONS.

## SECTION I.

### *DEFINITIONS.*

1. How many apples are one half of 60 apples? One third of 60 apples? One fourth of 60 apples?
2. How many dollars are one half of $60? One third of $60? One fourth of $60?
3. How many bushels are one half of 60 bushels? One third of 60 bushels? One fourth of 60 bushels?
4. *How do you find one half of any number of things? One third? One fourth? One fifth?*

When an apple, a dollar, a bushel, or a one of any kind, is divided into two equal parts, one of the parts is *one half* ($\frac{1}{2}$) of the one divided.

When a one of any kind is divided into three equal parts, one of the parts is *one third* ($\frac{1}{3}$);

When a one is divided into four equal parts, one of the parts is *one fourth* ($\frac{1}{4}$); and so on.

When a one is divided into three equal parts, two of the parts are *two thirds* ($\frac{2}{3}$); when into four equal parts, two of the parts are *two fourths* ($\frac{2}{4}$), and three of the parts are *three fourths* ($\frac{3}{4}$); when into five equal parts, one of the parts is

*one fifth* ($\frac{1}{5}$), two of the parts are *two fifths* ($\frac{2}{5}$), three of the parts are *three fifths* ($\frac{3}{5}$), and four of the parts are *four fifths* ($\frac{4}{5}$).

When a one is divided into six equal parts, the parts are *sixths;* when into seven equal parts, they are *sevenths;* when into eight equal parts, they are *eighths;* when into nine equal parts, they are *ninths;* when into ten equal parts, they are *tenths;* and so on.

Each of the numbers $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and so on, expresses one of the equal parts of a one.

The number $\frac{2}{3}$ expresses, either that 2 is divided into 3 equal parts; or that 1 is divided into 3 equal parts, and 2 of those parts are taken.

5. What does the number $\frac{3}{4}$ express? What the number $\frac{2}{5}$?
6. What does the number $\frac{5}{6}$ express? The number $\frac{4}{7}$?
7. What is expressed by the number $\frac{4}{5}$? By $\frac{3}{8}$? By $\frac{7}{10}$?
8. What is expressed by the fraction $\frac{3}{4}$ of an apple?
9. What do you understand by $\$\frac{3}{5}$?
10. Explain the meaning of $\frac{9}{16}$ lb., and $\frac{4}{12}$ doz.

A *Fractional Unit* is one of the equal parts into which a thing, or the unit 1, is divided: as, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and so on. And

A *Fraction* is a number consisting of one or more fractional units: as, $\frac{1}{4}$, $\frac{2}{3}$, $\$\frac{5}{8}$, $\frac{7}{15}$ lb.

11. What is the fractional unit of $\$\frac{3}{4}$? Of $\frac{3}{4}$ ft.? Of $\frac{3}{4}$ lb.?
12. What is the fractional unit of $\frac{5}{8}$ yd.? Of $\frac{13}{16}$ bu.? Of $\frac{9}{10}$ cwt.?

The *Terms* of a fraction are the two numbers used to express it. Thus, the terms of the fraction $\frac{5}{7}$ are 5 and 7.

The *Denominator* of a fraction is that term which expresses the number of equal parts into which *one* is divided; it is written below the horizontal line.

The *Numerator* is that term which expresses the number of equal parts indicated by the fraction; it is written above the line. Thus, in the fraction $\frac{4}{5}$, the 5 is the denominator,

and expresses that 1 is divided into 5 equal parts; and the 4 is the numerator, and expresses that 4 of the equal parts (fifths) are indicated by the fraction.

13. What are the terms of the fractions $\frac{4}{7}$, $\frac{3}{5}$, $\frac{9}{12}$, and $\frac{2}{3}\frac{3}{5}$?

14. What is the denominator of each of the fractions $\frac{1}{5}$, $\frac{7}{10}$, $\frac{1}{2}\frac{1}{5}$, and $\frac{3}{4}\frac{5}{6}$, and what does it express?

15. What is the numerator of each of the fractions $\frac{1}{3}$, $\frac{9}{12}$, $\frac{3}{7}$, and $\frac{2}{3}\frac{3}{4}$, and what does it express?

16. Name the terms, the denominator, the numerator, the fractional unit, and the number of fractional units in $\frac{7}{10}$. In $\frac{3}{8}$ mi. In $\frac{5}{9}$ sq. yd. In $\frac{3}{12}$ gal.

A *Proper Fraction* is a fraction whose value is less than 1; as $\frac{4}{5}$, $\frac{7}{10}$, $\frac{5}{8}$, $\frac{7}{16}$. Its numerator is always less than its denominator.

An *Improper Fraction* is a fraction whose value equals or exceeds 1; as $\frac{8}{5}$, $\frac{1}{1}\frac{3}{0}$, $\frac{8}{8}$, $\frac{1}{1}\frac{8}{6}$, $\frac{2}{1}\frac{1}{3}$. Its numerator is never less than its denominator.

*Similar Fractions* are those that have a common fractional unit; as, $\frac{4}{5}$ and $\frac{1}{5}$; $\frac{3}{8}$, $\frac{1}{8}$, and $\frac{5}{8}$.

The denominators of similar fractions are alike. Such fractions are said to have a *Common Denominator.*

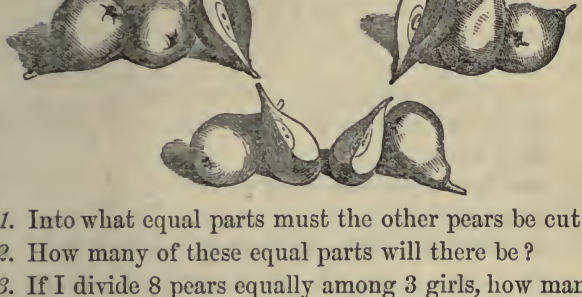
*Dissimilar Fractions* are those that have different fractional units; as, $\frac{2}{3}$ and $\frac{4}{7}$; $\frac{3}{5}$, $\frac{5}{8}$, and $\frac{1}{2}$.

17. If 5 apples are divided equally between 2 children, what part of the 5 apples will each child have?

18. How many apples must be cut into equal parts?

19. If 5 apples are divided equally between 2 children, how many apples will each child receive?

20. If I divide 8 pears equally among 3 girls, how many whole pears can I give to each girl?



*21.* Into what equal parts must the other pears be cut?

*22.* How many of these equal parts will there be?

*23.* If I divide 8 pears equally among 3 girls, how many pears will each girl receive?

One lemon is what part

*24.* Of 2 lemons?
*25.* Of 3 lemons?
*26.* Of 5 lemons?
*27.* Of 7 lemons?
*28.* Of 10 lemons?
*29.* Of 15 lemons?

What part of

*30.* 1 doz. oranges is 1 orange?
*31.* 1 ft. is 1 in.?
*32.* 1 lb. is 1 oz.?
*33.* 1 qt. is 1 pt.?
*34.* 1 gal is 1 pt.?
*35.* 1 yd. is 1 in.?

When a number is expressed by an integer and a fraction, it is a *Mixed Number;* as, $3\frac{5}{8}$, $11\frac{2}{3}$, $14\frac{2}{17}$.

*36.* Which of the fractions in the margin are proper fractions, and why?
*37.* Which are improper fractions, and why?
*38.* Which are mixed numbers, and why?
*39.* Which are similar fractions, and why?

$\frac{4}{9}$, $\frac{5}{8}$, $3\frac{5}{8}$, $\frac{4}{7}$, $\frac{5}{7}$, $\frac{1}{16}$, $\frac{5}{6}$, $11\frac{2}{3}$, $\frac{7}{16}$, $\frac{17}{15}$, $\frac{5}{9}$, $\frac{1}{2}$, $\frac{8}{13}$, $\frac{9}{9}$, $3\frac{7}{16}$.

*40.* Which are dissimilar fractions, and why?

*41.* What do you understand by 1 half of any number or thing? By 1 third? 1 fourth? 1 fifth? 1 eighth?

*42.* What do you understand by 2 thirds of any number or thing? By 3 fifths? By 7 eighths?

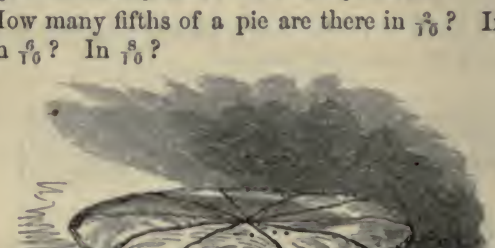
*43.* What do you understand by 2 halves of any number or thing? By $\frac{3}{3}$? By $\frac{5}{5}$? By $\frac{8}{8}$? By $\frac{6}{6}$? By $\frac{7}{4}$? By $\frac{12}{8}$?

# SECTION II.

## *REDUCTIONS.*

### 22. Fractions to Lowest Terms.

1. If a pie be cut into 10 equal parts, what will one of the parts be?
2. Into how many fifths can a pie be cut? Into how many halves?
3. $\frac{1}{10}$ are how many fifths? How many halves?
4. How many fifths of a pie are there in $\frac{2}{10}$? In $\frac{4}{10}$? In $\frac{6}{10}$? In $\frac{8}{10}$?



5. Reduce $\frac{5}{10}$ to halves.
6. $\frac{2}{4}$ of a melon are how many halves?
7. $\frac{4}{8}$ of a melon are how many fourths?
8. $\frac{6}{10}$ of a melon are how many eighths? How many fourths? How many halves?
9. Change $\frac{1}{3}\frac{2}{7}$ of a cubic yard to thirds. *Methods, page 178.*
10. $\frac{1}{2}\frac{3}{0}$ of a dollar are how many tenths? How many fifths?
11. $\frac{1}{2}\frac{5}{0}$ of a dollar are how many fifths?
12. Reduce $\frac{6}{1}\frac{4}{2}\frac{0}{0}$ to sixtieths. To thirtieths. To fifteenths.
13. *Dividing both terms of a fraction by the same number, has what effect upon the value of the fraction?*

When the terms of a fraction have no common factor, they are *Prime to Each Other.*

A fraction is in its *Lowest Terms,* when its terms are prime to each other.

*14.* Reduce $\frac{8}{25}$ to its lowest terms. *Methods, page 178.*

*15.* What are the lowest terms of the fraction $\frac{20}{35}$?

*16.* Reduce the fractions $\frac{4}{20}$ and $\frac{6}{14}$ to their lowest terms.

*17.* Reduce $\frac{7}{35}$ and $\frac{14}{16}$ to their lowest terms.

*18.* Reduce $\frac{34}{7}$ and $\frac{52}{16}$ to their lowest terms.

*19.* James has $\frac{2}{8}$ of an apple, and Charles has $\frac{6}{24}$. Which has the greater fraction?

*20.* Which is the greater sum of money, $\$\frac{6}{30}$ or $\$\frac{8}{40}$?

*21.* Andrew dug 5 rows of potatoes, which yielded respectively $\frac{6}{9}$ bu., $\frac{18}{27}$ bu., $\frac{42}{63}$ bu., $\frac{8}{12}$ bu., and $\frac{48}{72}$ bu. Which row gave the greatest yield?

*22.* Reduce $\frac{18}{45}$, $\frac{40}{25}$, and $\frac{55}{25}$ to their lowest terms.

## 23. Fractions to Given Denominators.

*23.* If a pie is cut into 10 equal pieces, how many of these pieces will there be in one half of the pie?

*24.* How many of these equal pieces will there be in $\frac{1}{5}$ of the pie? How many in $\frac{2}{5}$ of it? In $\frac{3}{5}$? In $\frac{4}{5}$?

*25.* Reduce $\frac{1}{2}$, $\frac{2}{5}$, $\frac{3}{5}$, and $\frac{4}{5}$ to tenths.

*26.* 1 half of an apple is how many quarters or fourths?

*27.* 1 third of a pear is how many sixths?

*28.* How many eighths of a bushel is $\frac{1}{4}$ bu.?

*29.* Change $\frac{1}{5}$ of an hour to fifteenths of an hour.

*30.* 2 thirds of a pear are how many sixths?

*31.* How many eighths of a bushel are $\frac{3}{4}$ bu.?

*32.* Reduce $\frac{5}{8}$ lb. to sixteenths. *Methods, page 178.*

*33.* Reduce $\frac{3}{4}$ to eighths. To twelfths. To twentieths.

*34.* How many twenty-fourths are $\frac{1}{2}$? How many are $\frac{2}{3}$? Are $\frac{3}{4}$? $\frac{3}{6}$? $\frac{5}{6}$? $\frac{7}{12}$?

35. *Multiplying both terms of a fraction by the same number has what effect upon the value of the fraction?*

36. $\frac{1}{2}$ equals how many tenths?

37. By what number will you multiply the terms of the fraction $\frac{4}{5}$, to reduce it to twenty-fifths?

38. Reduce $\frac{4}{7}$ to twenty-sevenths.

39. How may fourths be reduced to twentieths? Eighths to fortieths?

40. What is the least denominator, greater than 3, to which thirds can be reduced? Why?

41. Name the first three denominators, in order of size, to which fifths can be reduced.

42. Why can fifths be reduced to each of these denominators?

43. *If any fraction is reduced to an equal fraction, having a greater denominator, what must that denominator be?*

44. Reduce to twelfths $\frac{1}{6}$ ft., and $\frac{2}{3}$ ft.; $\frac{3}{4}$ doz., and $\frac{1}{2}$ doz.

45. Reduce $\frac{3}{4}$ A. and $\frac{2}{5}$ A. to twentieths of an acre?

46. Change as many as possible of the following fractions to twenty-fourths: $\frac{2}{3}$ da., $\frac{5}{8}$ da., $\frac{4}{9}$ da., $\frac{7}{12}$ da., $\frac{3}{10}$ da., $\frac{6}{16}$ da., $\frac{9}{18}$ da., and $\frac{8}{48}$ da.

47. *What fractions can be reduced to a given denominator?*

48. How may $\frac{4}{5}$ be reduced to fortieths?

49. How may $\frac{7}{11}$ be reduced to one hundred forty-sevenths?

50. Reduce \$$\frac{1}{2}$, \$$\frac{1}{4}$, \$$\frac{1}{5}$, \$$\frac{1}{10}$, \$$\frac{1}{20}$, and \$$\frac{1}{25}$ to hundredths.

## 24. Dissimilar Fractions to Similar Fractions.

51. Reduce $\frac{1}{2}$ and $\frac{2}{3}$ to sixths.

52. Change $\frac{5}{6}$ and $\frac{3}{4}$ to twelfths; and $\frac{4}{7}$ and $\frac{3}{5}$ to thirty-fifths.

53. Reduce $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{7}{9}$ to ninetieths.

54. In the results in the three preceding problems, the common denominator of the similar fractions is the product of what terms?

55. What is the common denominator of the similar fractions to which $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{5}{8}$ may be reduced?

56. In solving problem 55, by what numbers must the terms of $\frac{1}{8}$ be multiplied? The terms of $\frac{3}{4}$? Of $\frac{2}{5}$?

57. *In reducing dissimilar fractions to similar fractions, by what must the terms of each given fraction be multiplied?*

58. Reduce $\frac{3}{4}$ and $\frac{5}{6}$ to similar fractions.

59. Reduce $\frac{5}{7}$ and $\frac{1}{9}$ to similar fractions. *Methods, page 178.*

60. What similar fractions are equal to $\frac{4}{15}$ and $\frac{7}{8}$?

61. Change $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{11}$ to similar fractions.

62. Reduce $\frac{3}{7}$ and $\frac{8}{13}$ to fractions of the same fractional unit.

63. Reduce $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{3}$, and $\frac{5}{6}$ to similar fractions.

64. Reduce the same fractions to similar fractions having 72 for a common denominator. Reduce them to forty-eighths.

65. Reduce the same fractions to twenty-fourths. To twelfths.

66. What fractions can be reduced to twelfths? Why?

67. Which of the fractions $\frac{4}{9}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{4}{7}$, and $\frac{1}{2}$ can be reduced to eighteenths, and which can not? Why?

68. *What fractions can be reduced to equal fractions having a given denominator?*

69. *What is the denominator of the least similar fractions to which any two or more given fractions can be reduced?*

70. What are the denominators of the fractions which can be reduced to fifteenths? To sixteenths? To twentieths?

71. What fractions can be reduced to thirty-ninths? To sixty-fourths? To eighty-firsts? To two hundredths?

72. Reduce $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{6}$ to least similar fractions.

73. Reduce $\frac{2}{3}$ cu. yd., $\frac{19}{27}$ cu. yd., and $\frac{7}{9}$ cu. yd. to least similar fractions.

74. What is the common denominator of the least similar fractions equal to the fractions $\frac{7}{8}$, $\frac{1}{24}$, and $\frac{13}{16}$? What are the new numerators?

75. Reduce $\frac{2}{3}$, $\frac{3}{5}$, $\frac{7}{25}$, and $\frac{2}{15}$ to least similar fractions.

76. What is the fractional unit of the least similar fractions equal to $\frac{4}{15}$, $\frac{3}{10}$, $\frac{23}{30}$, and $\frac{1}{5}$?

77. What are the least similar fractions?

78. Change $\frac{3}{10}$, $\frac{11}{15}$, $\frac{3}{5}$, $\frac{11}{12}$, $\frac{1}{12}$, and $\frac{7}{20}$ to least similar fractions. What is the least common fractional unit?

79. Reduce $\frac{1}{4}$, $\frac{5}{7}$, and $\frac{2}{3}$ to least similar fractions.

## 25. Improper Fractions to Integers or Mixed Numbers.

80. How many dollars are 2 halves of a dollar? 5 fifths of a dollar? 8 eighths of a dollar?

81. *When is the value of a fraction a one? Why?*

82. A boy has 4 half-dollars. How many dollars has he?

83. A girl buys 12 fourths of a yard of ribbon. How many yards does she buy?

84. How many feet are $\frac{7}{4}$ of a foot? *Methods, page 178.*

85. How many dozen are $\frac{30}{6}$ of a dozen?

86. Reduce $\frac{56}{8}$ gal. to gallons.

87. A barber receives 5 half-dollars for each day's work. How much are his daily wages?

88. One week a cook used $\frac{9}{4}$ of a gallon of syrup. How many gallons did she use?

89. A tailor used $\frac{23}{8}$ yd. of beaver cloth in making an overcoat. How many yards did he use?

90. One day a confectioner sold 63 quarter-pound packages of candy. How many pounds did he sell?

91. Reduce $\frac{17}{5}$ min. to minutes.

92. Reduce $1\frac{1}{2}$ to a mixed number.

93. $\frac{11}{4}$ are how many ones?

94. Change $1\frac{1}{5}$, $\frac{21}{7}$, $\frac{14}{8}$, and $\frac{12}{12}$ to integers or mixed numbers.

## 26. Integers or Mixed Numbers to Fractions.

95. How many half-barrels can be filled with 3 barrels of flour?

96. How many tenths of a dollar are 7 dollars?

97. Reduce 9 yards to fourths. To eighths.

98. Reduce 27 to fifths. To ninths.

99. Reduce $8\frac{4}{9}$ to ninths. *Methods, page 179.*

100. How many eighths of a cord of wood in $2\frac{1}{8}$ cords?

101. How many quarter-dollars will it take to pay for a fur cap that costs $\$6\frac{3}{4}$?

102. How many half-yards are one rod? How many half-feet?

103. $5\frac{3}{5}$ tons of hay are how many fifths of a ton?

104. How many sixteenths of a pound are $3\frac{9}{16}$ pounds of butter?

105. Reduce $27\frac{3}{10}$ A. to tenths of an acre.

106. Reduce $29\frac{4}{9}$ and $7\frac{35}{100}$ to improper fractions.

## SECTION III.

### *ADDITION.*

1. A MOTHER having a melon, gave 2 ninths of it to her boys, and 5 ninths of it to her girls. How many ninths of the melon did she give to her children?

2. A teamster feeds his horses $\frac{3}{8}$ of a bushel of oats in the morning, $\frac{2}{8}$ at noon, and $\frac{3}{8}$ at night. How many eighths of a bushel does he feed his horses daily?

3. A lady paid $\$\frac{3}{10}$ for eggs, and $\$\frac{4}{10}$ for butter. How much did the butter and eggs cost her?

4. Cynthia paid $\$\frac{7}{8}$ for a pair of gloves, $\$\frac{5}{8}$ for a handkerchief, $\$\frac{3}{8}$ for a neck ribbon, and $\$\frac{2}{8}$ for a collar. How many dollars did she expend?

5. How many hours are $\frac{2}{5}$ h., $\frac{1}{5}$ h., $\frac{4}{5}$ h., and $\frac{3}{5}$ h.?

6. What is the common fractional unit of $\frac{4}{7}$, $\frac{3}{7}$, $\frac{6}{7}$, and $\frac{5}{7}$?

7. How many fractional units does each of these fractions express?

8. What is the sum of these fractional units?

9. *How are similar fractions added?*

10. What similar fractions are equal to $\$\frac{1}{2}$ and $\$\frac{1}{4}$?

11. What is the sum of these similar fractions?

12. A housekeeper paid $\$\frac{1}{2}$ for celery, and $\$\frac{1}{4}$ for cabbage. How much did she pay for both?

13. My door-yard contains $\frac{1}{4}$ A., and my garden $\frac{1}{2}$ A. How much land in my door-yard and garden?

14. Roger worked $\frac{7}{10}$ h. to saw his wood, and $\frac{1}{2}$ h. to split it. How many hours did he work?

15. A farmer cut $\frac{3}{8}$ of his meadow one day, and $\frac{5}{8}$ of it the next day. How much of it did he cut in the two days? *Methods, page 179.*

16. A gardener has $\frac{3}{8}$ A. of tomatoes, and $\frac{2}{8}$ A. of cucumbers. How much land has he planted to both?

17. What is the sum of $\frac{2}{3}$ and $\frac{1}{3}$? Of $\frac{1}{10}$ and $\frac{1}{5}$?

18. Add $\frac{2}{3}$ and $\frac{1}{7}$; also $\frac{1}{2}$ and $\frac{1}{10}$.

19. *In adding dissimilar factions, what is the first step?*

20. *What is the second step?*

21. During a campaign $\frac{1}{10}$ of a regiment were killed, $\frac{1}{8}$ were wounded, and $\frac{1}{4}$ were taken prisoners. What part of the regiment was lost to the service?

22. Ida bought a box of figs, and gave $\frac{1}{3}$ of them to her father, $\frac{1}{4}$ of them to her mother, and $\frac{1}{10}$ of them to her sister. What part of them did she give away?

23. Levi gave $\$\frac{3}{4}$ for his skates, $\$\frac{1}{2}$ for the straps for them, and $\$\frac{3}{8}$ for his sled. How much did all cost him?

24. Mr. Barnet has $\frac{5}{8}$ mi. of rail fence on his farm, $\frac{7}{8}$ mi. of board fence, and $\frac{7}{10}$ mi. of stone fence. How much fence is there on his farm?

25. A lawyer used $\frac{7}{12}$ of a quire of legal-cap paper on Monday, $\frac{2}{3}$ of a quire on Tuesday, $\frac{5}{8}$ of a quire on

Wednesday, $\frac{5}{6}$ of a quire on Thursday, and $\frac{3}{4}$ of a quire on Friday. How much paper did he use?

26. What is the sum of $\frac{4}{5}$, $\frac{1}{11}$, and $\frac{1}{2}$?

27. Add $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{4}{5}$.

28. Add $\frac{3}{10}$, $\frac{4}{7}$, and $\frac{1}{3}$.

29. Add $\frac{1}{4}$, $\frac{5}{6}$, and $\frac{5}{8}$.

30. Add $\frac{5}{6}$, $\frac{4}{5}$, $\frac{1}{10}$, and $\frac{2}{3}$.

31. Hattie's age is $6\frac{1}{3}$ years, Jennie's age is $5\frac{1}{3}$ years, and the age of their brother Harry is $3\frac{5}{12}$ years. What is the sum of their ages?

32. A merchant sold 2 bu. of clover seed to one farmer, $\frac{3}{4}$ bu. to another, and $\frac{7}{8}$ bu. to a third. How much did he sell to all of them?

33. A teamster drew $\frac{7}{8}$ cd. of wood at one load, and $1\frac{1}{4}$ cd. at another load. How much wood did he draw?

34. A mechanic earned $\$1\frac{1}{2}$ in the forenoon, and $\$1\frac{2}{5}$ in the afternoon. How much did he earn in the day?

35. Jonas gave $\$2\frac{3}{4}$ for a sheep, and sold it for $\$\frac{7}{10}$ more than it cost him. For how much did he sell it?

36. What is the sum $3\frac{5}{8}$ of and $6\frac{4}{7}$?

37. Add $15\frac{3}{5}$ and $8\frac{5}{8}$?

38. Add $4\frac{7}{12}$ and $\frac{1}{3}$?

39. Add 5 and $7\frac{3}{10}$.

40. Add 6, $2\frac{1}{2}$, and $\frac{5}{7}$.

41. Add $18\frac{4}{11}$ and $7\frac{3}{8}$.

42. Add $5\frac{2}{3}$, $7\frac{1}{2}$, and $4\frac{3}{4}$.

43. A man, in trying the speed of his horse, trotted him one mile in $2\frac{7}{12}$ min., a second mile in $2\frac{2}{5}$ min., and a third mile in $2\frac{3}{4}$ min. In how many minutes did the horse trot the three miles?

44. In a city are four street railroads, one $3\frac{1}{4}$ mi. long, another $2\frac{9}{10}$ mi. long, another $4\frac{1}{3}$ mi. long, and the fourth $1\frac{5}{8}$ mi. long. What is the length of all of them?

What is the sum

45. Of $\frac{4}{7}$, $2\frac{3}{8}$, and 17?

46. Of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$?

47. Of $2\frac{7}{9}$, $4\frac{5}{6}$, and $3\frac{3}{8}$?

48. Of $3\frac{1}{3}$, $2\frac{1}{8}$, $4\frac{3}{7}$, and 6?

## SECTION IV.

### *SUBTRACTION.*

1. AMANDA cut $\frac{3}{8}$ of a yard of silk from a piece that contained $\frac{7}{8}$ of a yard. How many eighths of a yard of silk were left in the piece?

2. Ethan gathered $\frac{1}{12}$ bu. of walnuts, and sold all but $\frac{4}{12}$ bu. of them. How many did he sell?

3. From $\frac{9}{15}$ subtract $\frac{4}{15}$.

4. One forenoon a man sawed $\frac{7}{8}$ cd. of wood, and his son sawed $\frac{3}{8}$ cd. How much more did the father saw than the son?

5. *How are similar fractions subtracted?*

6. What similar fractions are equal to $\frac{7}{8}$ and $\frac{3}{8}$?

7. Find the difference between these similar fractions.

8. Gerald having $\frac{3}{4}$, gave $\frac{2}{5}$ for a slate. How much money had he left? *Methods, page 179.*

9. What is the difference between $\frac{1}{4}$ and $\frac{2}{5}$?

10. A druggist poured $\frac{5}{12}$ gal. of alcohol from a jug that contained $\frac{1}{2}$ gal. How much alcohol was left?

11. If I have a village lot of $\frac{9}{12}$ A., and I sell $\frac{5}{12}$ A., how large a lot shall I have left?

12. A merchant buys molasses at $\frac{1}{3}$, and sells it at $\frac{1}{12}$ a gallon. How much is his gain per gallon?

13. $\frac{7}{8} - \frac{5}{11}$ = what number?

14. $\frac{2}{3} - \frac{2}{5}$ = what number?

15. What is the difference between $\frac{2}{3}$ and $\frac{1}{4}$?

16. *In subtracting dissimilar fractions, what is the first step?*

17. *What is the second step?*

18. Eli paid $\frac{4}{7}$ of the cost of a sled, and Carlos paid the rest. How much of the cost did Carlos pay?

19. Anna will be 13 years old in $\frac{3}{5}$ of a year. How old is she now? *Methods, page 179.*

20. A housekeeper bought 2 bu. of potatoes, and used $\frac{3}{8}$ bu. the same day. How many had she left?

21. If I buy a hammer for $\$\frac{7}{10}$, and I give in payment a 5-dollar bill, how much change shall I receive?

22. 30 is how much more than $\frac{7}{8}$?

23. A grain buyer paid $\$1\frac{1}{4}$ a bushel for wheat, but was obliged to sell it at a loss of $\$\frac{1}{8}$ a bushel. At what price did he sell it?

24. A gardener raised $11\frac{1}{4}$ bu. of beans, and sold $\frac{7}{12}$ bu. How many had he left? *Methods, page 179.*

25. I owe $\$5\frac{1}{2}$; if I pay $\$\frac{7}{8}$, how much shall I then owe?

26. $4\frac{5}{12}$ is how much greater than $\frac{5}{7}$?

27. $64\frac{1}{10}$ is how much greater than $\frac{5}{8}$?

28. What is the difference between $6\frac{1}{7}$ and $4\frac{5}{7}$?

29. If I have $\$5\frac{1}{4}$, and I pay $\$2\frac{1}{3}$ for a pair of fur gloves, how much money shall I have left?

30. A laborer who earns $\$8\frac{1}{4}$ a week, expends $\$6\frac{2}{3}$. How much does he save weekly?

31. From a cask of vinegar containing $32\frac{1}{8}$ gal., a clerk drew $5\frac{1}{2}$ gal. How much vinegar was left in the cask?

32. A butcher sold $9\frac{5}{16}$ lb. from a quarter of beef that weighed $93\frac{1}{8}$ lb. How many pounds had he left?

33. A man traveled $16\frac{4}{5}$ mi. in the forenoon, and $31\frac{8}{9}$ mi. in the day. How far did he travel in the afternoon?

34. From $17\frac{1}{12}$ subtract $4\frac{1}{3}$.

35. $25\frac{1}{4}$ is how much greater than $6\frac{4}{15}$?

36. 6 is how much greater than $4\frac{1}{2}$?

37. From a box containing 10 pounds of raisins, a grocer sold $4\frac{5}{8}$ pounds. How many pounds of raisins were left in the box?

## SECTION V.

### *MULTIPLICATION.*

### 27. A Fraction by an Integer.

1. How many sevenths of a week are 5 times 1 seventh of a week?
2. How many fifths of a dollar are 6 times 2 fifths of a dollar? How many dollars?
3. How much will 6 bushels of apples cost, at $\$\frac{2}{5}$ per bushel? *Methods, page 179.*
4. How many acres of corn can 6 men hoe in a day, if they average $\frac{1}{8}$ of an acre each?
5. How much will 12 lb. wool cost, at $\$\frac{1}{10}$ a pound?
6. *What effect is produced by multiplying the numerator of a fraction by an integer?*
7. Multiply $\frac{1}{4}$ by 16.
8. What is the product of $\frac{1}{12}$ multiplied by 7?
9. How much is 28 times $\frac{5}{9}$ sq. yd. of carpeting?
10. What part of 5 bushels is 1 bushel?
11. What part of 5 bushels are 2 bushels? Are 3 bu.?
12. A gardener bought 5 qt. of Early Kent peas. What part of a peck did he buy?
13. A farmer having a bushel (or 56 lb.) of coarse salt, used 28 lb. of it in packing a barrel of beef. What part of a bushel did he use to the barrel?

What part of

| | |
|---|---|
| 14. 6 yd. are 5 yd.? | 18. 1 gal. are 2 qt.? |
| 15. 9 pailfuls are 4 pailfuls? | 19. 1 pk. are 4 qt.? |
| 16. 25 bar. are 9 bar.? | 20. 1 mi. are 240 rd.? |
| 17. 12 candles are 8 candles? | 21. 1 lb. are 6 oz.? |

22. If 5 boys share 3 bushels of butternuts equally, what part of a bushel has each boy?

## 28. A Mixed Number by an Integer.

23. How much milk will be required to fill 3 pails, each of which holds $2\frac{1}{4}$ gallons?

24. How much will 15 barrels of XX flour cost, at $\$7\frac{7}{10}$ per barrel? *Methods, page 179.*

25. A sheriff, in pursuing a thief, drove $7\frac{3}{5}$ miles an hour for 5 hours. How many miles did he drive?

26. A grocer bought one dozen boxes of layer raisins, at $\$1\frac{7}{10}$ per box. How much did he pay for them?

27. 5 times $6\frac{5}{14}$ = how many? 50 times $4\frac{1}{3}$ = how many?

## 29. An Integer by a Fraction.

28. When 6 lb. of crushed sugar sell for \$1, how much does 1 pound cost?

29. When wood is \$5 a cord, how much must I pay for $\frac{1}{8}$ of a cord? *Methods, page 179.*

How much is

30. 1 fourth of 3 yd.?
31. 1 seventh of 5 da.?
32. 1 twelfth of 7 A.?
33. $\frac{1}{10}$ of 6 dimes?
34. $\frac{1}{64}$ of 24 bu.?
35. $\frac{1}{30}$ of 24 h.?

36. If a man lays 44 rods of stone-wall in 5 days, how many rods does he lay in 1 day?

37. A farmer raised 150 bushels of wheat on 7 acres. What was the average yield per acre?

38. At \$363 for 9 chests of tea, how much will 1 chest cost?

How much is

39. $\frac{1}{8}$ of 89 rods?
40. $\frac{1}{9}$ of 182 pounds?
41. $\frac{1}{16}$ of 166 bu.?
42. $\frac{1}{20}$ of 630 gal.?
43. $\frac{1}{7}$ of 365 da.?
44. $\frac{1}{5}$ of 752?

45. How much is 1 seventh of \$42? How much are 6 sevenths of \$42?

46. A laborer who earns \$42 a month, pays $\frac{2}{7}$ of his earnings for his board and washing. How much do his board and washing cost him?

47. The cleared land on a farm of 80 acres is $\frac{7}{10}$ of the whole farm. How many acres are cleared?

48. Last year a dairy-man made 77 cheeses, and this year he has made $\frac{10}{11}$ as many. How many cheeses has he made this year?

49. In a certain school are 49 pupils, $\frac{2}{7}$ of whom study grammar. How many study grammar?

50. A lumber dealer has 250 thousand feet of lumber, $\frac{3}{5}$ of which is pine. How many feet of pine lumber has he?

51. In a shoe-store there are 12 doz. pairs of rubbers, and $\frac{5}{6}$ of them are ladies' sizes. How many pairs of ladies' rubbers are there in the store?

52. Find $\frac{9}{10}$ of \$100.

How much is

53. $\frac{3}{4}$ of 126 gal.?
54. $\frac{1}{7}$ of $\frac{2}{3}$ of 126 gal.?
55. $\frac{1}{2}$ of $\frac{1}{4}$ of 182?
56. $\frac{1}{4}$ of $\frac{1}{2}$ of 182?

57. How much will $\frac{3}{8}$ lb. of cinnamon cost, at \$.60 a pound? *Methods, page 179.*

58. A tinsmith used $\frac{4}{7}$ of 3 sheets of tin, in making a pail. How much tin did he use?

59. How much is $\frac{3}{4}$ of 9 feet?

60. When coal is \$8 a ton, how much does $\frac{3}{5}$ of a ton cost?

How much is

61. $\frac{3}{4}$ of 5 sq. yd.?
62. $\frac{4}{5}$ of 4 quires?
63. $\frac{5}{16}$ of 63 gal.?
64. $\frac{3}{13}$ of 135 ft.?

## 30. An Integer by a Mixed Number.

65. At \$.10 a pound for sal soda, how much will 2 lb cost? How much will $\frac{1}{2}$ lb. cost? How much will $2\frac{1}{2}$ lb. cost?

66. In a pasture are 15 cows, and $4\frac{1}{3}$ times as many sheep. How many sheep are in the pasture?

67. One family burned 12 thousand feet of gas in a year, and another burned $3\frac{1}{6}$ times as much. How many thousand feet did the second family burn?

68. How many miles will a railroad train run in $2\frac{3}{4}$ h., at the rate of 24 mi. an hour? *Methods, page 179.*

69. How much will $3\frac{5}{8}$ gross of wood screws cost, at \$.64 per gross?

70. One year I raised 18 bu. of turnips, and $4\frac{2}{3}$ times as many potatoes. How many bushels of potatoes did I raise?

71. A family, in one year, use 20 lb. of coffee, and $8\frac{7}{10}$ times as much sugar. How much sugar do they use?

How much are

72. $3\frac{1}{2}$ times 5 yd.?
73. $12\frac{1}{4}$ times 8 da.?
74. $15\frac{1}{2}$ times 9?
75. $6\frac{3}{4}$ times 8 gal.?
76. $6\frac{3}{4}$ times 5 mi.?
77. $24\frac{5}{6}$ times 8?

## 31. A Fraction or a Mixed Number by a Fraction or a Mixed Number.

78. Grace used 1 half of $\frac{2}{3}$ of a roll of wall paper, in papering a box. What fraction of a roll did she use?

79. When a bushel of corn is worth $\$\frac{4}{5}$, how much will 1 fourth of a bushel cost? How much will 3 fourths of a bushel cost?

80. How much will $\frac{3}{4}$ gal. of molasses cost, at $\$\frac{4}{5}$ per gallon? *Methods, page 179.*

81. If I feed my chickens $\frac{2}{3}$ of $\frac{3}{4}$ of a bushel of grain in a week, what part of a bushel do I feed them?

82. A man who owned $\frac{1}{2}\frac{4}{5}$ of a schooner, sold $\frac{3}{7}$ of his share. What part of the schooner did he sell?

What fraction is equal to

83. $\frac{3}{4}$ of $\frac{2}{3}\frac{8}{3}$ of a rod?
84. $\frac{5}{6}$ of $\frac{3}{1}\frac{7}{0}\frac{7}{0}$ of a cargo of tea?
85. $\frac{6}{8}$ of $\frac{2}{3}\frac{0}{1}$?
86. $\frac{2}{3}$ of $\frac{6}{7}$ of $\frac{1}{1}\frac{4}{5}$?

87. Last year my trees bore $2\frac{1}{2}$ bushels (or $\frac{5}{2}$ bushels) of plums, and I sold $\frac{3}{5}$ of them. How many bushels did I sell?

88. At $\$1\frac{3}{4}$ a pound, how much will $\frac{3}{8}$ lb. of tea cost?

89. How much is $\frac{4}{5}$ of $10\frac{3}{8}$ yards?

How much is

| | |
|---|---|
| 90. $\frac{4}{5}$ of $15\frac{3}{7}$? | 92. $\frac{3}{10}$ of $6\frac{3}{4}$? |
| 91. $\frac{3}{8}$ of $42\frac{1}{2}$? | 93. $\frac{5}{12}$ of $6\frac{4}{11}$? |

94. $\$\frac{1}{5}$ is how many twentieths of a dollar? How much is $\frac{1}{4}$ of $\$\frac{4}{20}$? Then, how much is $\frac{1}{4}$ of $\$\frac{1}{5}$?

95. How much is $\frac{1}{4}$ of $\$\frac{1}{5}$? How much is $\frac{1}{4}$ of $\$\frac{3}{5}$?

96. How much is $\frac{1}{5}$ of $\frac{7}{8}$ yd.?

97. How much is $\frac{3}{5}$ of $\frac{7}{8}$ yd.? *Methods, page 179.*

98. How much will $\frac{3}{4}$ lb. of shot cost, at $\$\frac{3}{10}$ a pound?

99. If a boy saws $\frac{5}{8}$ of a cord of wood in a day, how much can he saw in $\frac{3}{4}$ of a day?

100. A family burns $\frac{2}{3}$ of a gallon of kerosene in a week. How much do they burn in $\frac{3}{7}$ of a week?

101. In the last problem, how may the numerator 6 of the result be obtained? How may the denominator 21 be obtained?

102. *When the factors are fractions, how may their product be obtained?*

| How much is | What is the product of |
|---|---|
| 103. $\frac{3}{10}$ of $\frac{7}{12}$ mi.? | 107. $\frac{3}{10}$ time $\frac{4}{5}$ of a ton? |
| 104. $\frac{7}{10}$ of $\frac{5}{8}$ da.? | 108. $\frac{5}{8}$ multiplied by $\frac{7}{11}$? |
| 105. $\frac{5}{8}$ of $\$\frac{4}{5}$? | 109. $1\frac{1}{3}\times\frac{4}{5}$? $\frac{5}{12}\times\frac{4}{5}$? |
| 106. $1\frac{1}{3}$ of $\frac{4}{5}$ T.? | 110. $\frac{3}{5}\times\frac{3}{11}$? $\frac{3}{5}\times\frac{7}{10}\times\frac{4}{5}$? |

111. At $\$\frac{4}{5}$ a yard, how much must I pay for $2\frac{3}{4}$ yards (or $\frac{11}{4}$ yards) of linen?

112. A farmer, in seeding $8\frac{3}{4}$ acres of land, used $\frac{2}{3}$ of a bushel of clover seed to the acre. How much clover seed did he use?

113. The sulphur and saltpeter in a pound of gunpowder weigh $\frac{6}{25}$ of a pound, and the charcoal weighs $3\frac{1}{6}$ times as much. What is the weight of the charcoal?

114. A young man bought $2\frac{1}{4}$ yd. of broadcloth for a coat, at $\$5\frac{1}{2}$ a yard. How much did the coat pattern cost?

115. How much will $8\frac{3}{4}$ cd. of wood cost, at $\$6\frac{2}{5}$ per cord?

116. A boy husked $7\frac{1}{2}$ bu. of corn in a day, and his father husked $3\frac{1}{3}$ times as much. How many bushels did the father husk?

117. A merchant having $10\frac{1}{2}$ yd. of serge, sold $\frac{3}{7}$ of it, at $\$1\frac{1}{10}$ a yard. How much did he receive for it?

What is the result in each of the next eight problems?

118. $\frac{5}{6}$ of $\$2\frac{2}{3}$?

119. $\frac{5}{6} \times 64\frac{8}{9}$?

120. $\frac{2}{3}$ of $7\frac{1}{8}$ bar.?

121. $13\frac{1}{3}$ doz. $\times \frac{7}{8}$?

122. $\frac{1}{2}$ mi. $\times 4\frac{1}{4}$?

123. $2\frac{1}{2} \times \frac{3}{4}$ yd.?

124. $\frac{4}{5} \times \frac{3}{11}$ of $6\frac{7}{8}$ lb.?

125. $2\frac{1}{2} \times 6\frac{2}{3} \times 8\frac{3}{4}$?

## SECTION VI.

### *DIVISION.*

### 32. A Fraction by an Integer.

1. If I divide $\frac{2}{3}$ of a melon equally between two girls, what part of the $\frac{2}{3}$ of a melon will each girl have?

2. How much is 1 half of $\frac{2}{3}$ of a melon?

3. What is the quotient of $\frac{2}{3}$ divided by 2?

4. Multiplying by $\frac{1}{2}$ obtains the same result as dividing by what number? Multiplying by $\frac{1}{3}$? By $\frac{1}{4}$?

5. If 3 oranges are worth $\frac{9}{10}$ of a pine-apple, what part of a pine-apple is 1 orange worth?

6. If 8 yd. of shirting cost $\$\frac{24}{5}$, how much will 1 yd. cost?

How much is

7. One half of $\frac{8}{9}$?
8. One ninth of $\frac{27}{35}$?
9. One sixth of $\frac{12}{13}$?
10. One fifth of $\frac{14}{15}$?

What is the quotient of

11. $\frac{8}{9}$ divided by 2?
12. $\frac{27}{35}$ divided by 9?
13. $\$\frac{12}{13}$ divided by \$6?
14. $\frac{14}{15}$ lb. divided by 5 lb.?

15. *What effect is produced by dividing the numerator of a fraction by an integer? Why?*

16. Divide $\frac{4}{7}$ by 9. Divide the same fraction by 6.

17. $\frac{12}{13}$ are how many times 4? How many times 8?

18. A boy sold 6 quarts of beechnuts for $\$\frac{12}{25}$. How much did he receive per quart for them?

19. If $\frac{3}{4}$ of a barrel of flour will last 12 persons 1 week, how much flour will last 1 person the same time?

20. I cut $\frac{1}{2}$ of a melon into 2 equal pieces. What part of the melon was each piece?

21. How much is 1 half of $\frac{1}{2}$ of a melon?

22. If I pay $\$\frac{3}{5}$ (or $\$\frac{12}{20}$) for 4 pounds of sugar, how much is the sugar per pound?

23. A teamster feeds 2 horses $\frac{3}{8}$ of a bushel of oats daily. How many oats does he feed each horse?

How many times are

24. 3 contained in $\frac{6}{7}$?
25. 5 contained in $\frac{3}{4}$?
26. 8 contained in $\frac{7}{8}$?

How much is

27. One third of $\frac{4}{5}$?
28. One fifth of $\frac{3}{4}$?
29. One eighth of $\frac{7}{8}$

30. *What effect is produced by multiplying the denominator of a fraction by an integer? Why?*

31. A fruit-dealer sold 10 muskmelons for $\$\frac{1}{3}$. How much did he receive apiece for them?

32. Johanna picked $\frac{7}{8}$ of a bushel of strawberries in 4 hours. How many berries did she pick in an hour?

33. Find the quotient of $\frac{4}{5}$ divided by 6. Of $\frac{4}{5}$ divided by 5.

34. $\frac{10}{11}$ is 12 times what number?

### 33. A Mixed Number by an Integer.

35. If $1\frac{1}{3}$ apples are divided equally between 2 boys, how many thirds of an apple will each boy receive?

36. If 7 bushels of oats cost $\$2\frac{4}{5}$, what is the price per bushel?

37. A man mowed $4\frac{1}{5}$ acres of grass in 3 days. How much did he mow in 1 day?

38. When photographs cost $\$2\frac{1}{2}$ per dozen, how much are they apiece?

39. When eggs are $\$.37\frac{1}{2}$ per doz., what is 1 egg worth?

40. A butter buyer paid $\$84\frac{3}{5}$ for 9 tubs of butter. How much did he pay for 1 tub?

| How many times are | How much is |
|---|---|
| 41. \$6 contained in $\$41\frac{3}{8}$? | 45. $\frac{1}{8}$ of $\$41\frac{3}{8}$? |
| 42. 8 h. contained in $16\frac{4}{5}$ h.? | 46. $\frac{1}{8}$ of $16\frac{4}{5}$ h.? |
| 43. 5 yd. contained in $28\frac{1}{3}$ yd.? | 47. $\frac{1}{3}$ of $23\frac{1}{3}$ yd.? |
| 44. 45 bu. contained in $54\frac{1}{2}$ bu.? | 48. $\frac{1}{4\frac{1}{5}}$ of $54\frac{1}{2}$ bu.? |

49. How many weeks will $35\frac{5}{8}$ pounds of butter last a family that use 4 pounds per week?

50. If $3\frac{1}{6}$ bar. of flour last 49 persons 1 month, what part of a barrel will last 1 person the same time?

### 34. An Integer by a Fraction.

51. If each person at dinner receives $\frac{1}{8}$ of a pie, and a whole pie is eaten, how many persons dine?

52. Among how many children can a melon be divided, if each child receive $\frac{1}{10}$ of a melon?

53. At $\$\frac{1}{5}$ apiece, how many market-baskets can be bought for \$2? How many for \$3? For \$5?

54. How many bushels of lime can be bought for \$4, at $\$\frac{1}{8}$ a bushel?

55. How many bushels can be bought for \$4, at $\$\frac{3}{8}$ a bushel? *Methods, page 180.*

56. Into how many pieces, each $\frac{2}{3}$ yd. long, can 6 yd. of wire be cut?

57. How many days will 9 bushels of oats last a horse, if he eats $\frac{3}{8}$ of a bushel daily?

58. A merchant paid $30 for a piece of linen, at $\$\frac{6}{10}$ per yard. How many yards were there in the piece?

| How many times are | What is the quotient of |
|---|---|
| 59. $\frac{1}{4}$ gal. contained in 7 gal.? | 62. 7 gal. divided by $\frac{1}{4}$? |
| 60. $\frac{2}{3}$ yd. contained in 16 yd.? | 63. 16 yd. divided by $\frac{2}{3}$? |
| 61. $\frac{1}{2}$ wk. contained in 12 wk.? | 64. 12 wk. divided by $\frac{1}{2}$? |

## 35. An Integer by a Mixed Number.

65. How many neck-ties, each $1\frac{1}{4}$ yd. (or $\frac{5}{4}$ yd.) long, can be made from a piece of ribbon containing 10 yd.?

66. A merchant tailor made 30 yd. of cassimere into suits of clothes, using $7\frac{1}{2}$ yd. of cloth for each suit. How many suits did he make?

67. A grocer paid $18 for mackerel, at $\$1\frac{1}{2}$ a kit. How many kits did he buy?

68. At $\$2\frac{2}{3}$ a bushel, how many bushels of grass seed can be bought for $20?

69. How many yards of cloth can be made from 62 lb. of wool, allowing $1\frac{3}{4}$ lb. to the yard?

70. A bricklayer received $72 for labor, at $\$2\frac{1}{2}$ per day, How many days did he work?

71. How many times are $2\frac{1}{2}$ contained in 13?

72. $80 \div 2\frac{1}{2}$ = how many? | 73. $625 \div 6\frac{1}{4}$ = how many?

## 36. Fractional Part or Parts given, to find the Whole.

74. If $\frac{1}{4}$ bar. of flour costs $2, how much will 1 bar. cost?

75. If $\frac{1}{3}$ of a bushel of potatoes will last a family 5 days, how many days will a bushel last them?

76. If $\frac{1}{2}$ quire of paper costs $.12$\frac{1}{2}$, how much will a quire cost?

77. If a farmer can hoe $\frac{4}{5}$ of an acre of corn in 8 hours, how many hours will it take him to hoe an acre?

78. If $\frac{1}{8}$ of a ton of old iron is worth $\$4\frac{1}{4}$, how much is a ton worth?

79. $\frac{1}{5}$ of my kite string is $7\frac{3}{4}$ yd. long. What is the length of my kite string?

80. Reuben gave $\$2\frac{3}{10}$ for bananas, spending $\frac{1}{3}$ of all his money. How much money had he?

81. One day a hunter used $\frac{3}{4}$ lb. of shot, which was $\frac{1}{7}$ of all he had. How many pounds of shot had he?

82. 12 is $\frac{1}{3}$ of how many?
83. 36 is $\frac{1}{8}$ of how many?
84. $\frac{1}{10}$ is $\frac{1}{8}$ of what number?
85. $\frac{13}{16}$ is $\frac{1}{5}$ of what number?
86. $\frac{4}{15}$ is $\frac{1}{5}$ of what number?
87. $3\frac{1}{3}$ is $\frac{1}{8}$ of what number?
88. $17\frac{3}{5}$ is $\frac{1}{2}$ of what number?
89. $9\frac{3}{7}$ is $\frac{1}{7}$ of what number?

90. If $\frac{3}{4}$ of a cord of wood costs \$6, how much does $\frac{1}{4}$ of a cord cost?

91. If $\frac{4}{5}$ of a pound of raisins cost \$.16, how much will $\frac{1}{5}$ of a pound cost? How much will a pound cost?

92. If a man can cut $\frac{2}{3}$ of a cord of wood in 4 hours, how many hours will it take him to cut 1 cord?

93. When $\frac{5}{7}$ bar. of flour are worth \$6, what is the price per barrel?

94. A mechanic worked $\frac{2}{3}$ of a week, and received \$10. How much were his weekly wages?

95. A fruit-grower, after selling 9 bushels of plums, found he had $\frac{1}{5}$ of his plums left. How many plums did he raise?

96. 8 is $\frac{2}{3}$ of what number?
97. 6 is $\frac{3}{4}$ of what number?
98. 10 is $\frac{5}{6}$ of what number?
99. 12 is $\frac{6}{7}$ of what number?
100. 22 is $\frac{5}{6}$ of what number?
101. 35 is $\frac{3}{5}$ of what number?
102. 125 is $\frac{10}{11}$ of what number?
103. 150 is $\frac{9}{10}$ of what number?

### 37. A Fraction or a Mixed Number by a Fraction.

*104.* A blacksmith received $\frac{3}{4}$ of a dollar for setting horse-shoes, at $\frac{1}{4}$ of a dollar each. How many shoes did he set?

*105.* If $\frac{2}{3}$ of a yard of velvet ribbon will cover 1 needle-book, how many needle-books will $\frac{8}{9}$ of a yard cover? How many books will $1\frac{1}{3}$ yards (or $\frac{4}{3}$ yd.), cover?

*106.* Some soldiers who messed together, received $6\frac{3}{4}$ pounds of meat daily. How many soldiers were there, there being $\frac{3}{4}$ of a pound of meat in a ration?

*107.* A ship's crew have $9\frac{3}{8}$ barrels of biscuit. How many weeks will it last them, if they use $\frac{5}{8}$ of a barrel weekly?

*108.* *When dividend and divisor are similar fractions, how is the division performed?*

What is the quotient of

*109.* $\frac{5}{8}$ yd. divided by $\frac{5}{8}$?
*110.* $\frac{7}{8}\frac{1}{0}$ mi. divided by $\frac{7}{8}\frac{7}{0}$?
*111.* $\$\frac{4}{1}\frac{3}{0}\frac{3}{0}$ divided by $\frac{1}{1}\frac{3}{0}\frac{3}{0}$?
*112.* $16\frac{1}{2}$ divided by $\frac{1}{2}$?
*113.* $5\frac{3}{4}$ divided by $\frac{1}{4}$?
*114.* $5\frac{3}{4}$ lb. divided by $\frac{1}{4}$ lb.?
*115.* $5\frac{3}{4}$ lb. divided by $\frac{1}{4}$ lb.?
*116.* $4\frac{2}{7}$ wk. divided by $\frac{1}{7}$ wk.?

*117.* Some men bought $\frac{3}{4}$ of a steam-boat, each man buying $\frac{3}{8}$ of her. How many men were there?

*118.* How much kerosene can be bought for $\$\frac{7}{1}\frac{7}{2}$, at $\$\frac{1}{3}$ per gallon? *Methods, page 180.*

*119.* A farmer sold some corn at $\$\frac{3}{4}$ a bushel, and received $\$7\frac{1}{2}$ for it. How many bushels did he sell?

*120.* How many days will $6\frac{3}{8}$ pounds of butter last a family, that use $\frac{3}{4}$ of a pound a day?

*121.* Halbert skated $16\frac{3}{4}$ miles, at the rate of $\frac{5}{1}\frac{5}{8}$ of a mile in a minute. How many minutes did it take him?

How many times are

*122.* $\frac{2}{3}$ contained in $\frac{8}{9}$?
*123.* $\frac{7}{1}\frac{7}{5}$ contained in $4\frac{1}{5}$?
*124.* $\frac{1}{4}$ contained in $\frac{1}{8}$?

Divide

*125.* $\frac{3}{2}\frac{5}{5}$ T. by $\frac{1}{4}$ T.
*126.* $5\frac{5}{1}\frac{5}{6}$ lb. by $\frac{1}{6}$ lb.
*127.* $16\frac{1}{2}$ ft. by $\frac{5}{8}$ ft.

*128.* How many quires of note paper can I buy for $\frac{7}{8}$ of a dollar, at $\frac{1}{5}$ of a dollar per quire?

*129.* If a family use $\frac{1}{6}$ of a barrel of potatoes in a week, how many weeks will $\frac{5}{8}$ of a barrel last them?

*130.* At $\$\frac{1}{4}$ a pound, how many pounds of coffee can be bought for $\$\frac{9}{10}$?

How many times is

*131.* $\frac{1}{5}$ contained in $\frac{6}{7}$?

*132.* $\frac{1}{8}$ contained in $\frac{7}{12}$?

*133.* $\frac{1}{10}$ contained in $\frac{7}{8}$?

What is the quotient of

*134.* $2\frac{4}{7}$ wk. divided by $\frac{1}{7}$ wk.?

*135.* $5\frac{3}{8}$ mi. divided by $\frac{1}{10}$ mi.?

*136.* $3\frac{1}{4}$ mi. divided by $\frac{1}{4}$ mi.?

*137.* How many pounds of citron can be bought for $\$\frac{5}{6}$, at $\$\frac{3}{4}$ per pound?

*138.* Nellie paid out $\$\frac{5}{8}$ for candies, at $\$\frac{2}{5}$ a pound. How many pounds of candies did she buy?

*139.* If a farm hand can plant $\frac{3}{40}$ of a field in one day, how many days will it take him to plant $\frac{2}{3}$ of it?

*140.* A grocer exchanged cheese for honey, at the rate of 1 lb. of cheese for $\frac{5}{8}$ of honey. How many pounds of cheese did he give for $4\frac{3}{8}$ lb. of honey?

*141.* *If dividend and divisor are dissimilar fractions, what step is necessary, preparatory to performing the division?*

*142.* *Then, when can a mixed number or a fraction be divided by a fraction?*

*143.* *When dividend and divisor are dissimilar fractions, how is the division performed?*

*144.* How many milk-cans can be made from $12\frac{3}{4}$ boxes of tin, if it takes $\frac{3}{8}$ of a box for one can?

*145.* $\frac{1}{2}$ is how many times $\frac{2}{5}$?

*146.* $1\frac{7}{8}$ are how many times $\frac{3}{8}$?

*147.* $2\frac{1}{2}$ are how many times $\frac{3}{10}$?

*148.* Divide $2\frac{1}{3}$ by $\frac{5}{7}$.

*149.* Divide $7\frac{1}{7}$ by $\frac{1}{2}$.

*150.* Divide $4\frac{1}{2}$ by $\frac{3}{5}$.

*151.* My garden, which contans $\frac{5}{8}$ of an acre, is $\frac{3}{4}$ of my whole village lot. What is the size of my lot?

*152.* In January I used $\frac{9}{16}$ of a ton of coal, which was $\frac{2}{15}$ of my year's supply. How much was my year's supply?

*153.* Jasper is $18\frac{3}{4}$ years old, and his age is equal to $\frac{5}{12}$ of his father's age. How old is his father?

*154.* A man's family expenses, which are $\$12\frac{4}{5}$ a week, are $\frac{4}{5}$ of what he earns. What are his earnings?

*155.* I gave $\frac{2}{3}$ as much for my wagon as for my horse, and my wagon cost me $\$96\frac{2}{3}$. How much did my horse cost me?

*156.* $\frac{5}{8}$ is $\frac{2}{3}$ of what number?
*157.* $1\frac{1}{2}$ is $\frac{3}{4}$ of what number?
*158.* $\frac{3}{16}$ is $\frac{1}{4}$ of what number?
*159.* $\frac{1}{15}$ is $\frac{3}{10}$ of what number?
*160.* $\frac{1}{11}$ is $1\frac{1}{2}$ of what number?

*161.* $3\frac{1}{2}$ is $\frac{4}{5}$ of what number?
*162.* $5\frac{1}{4}$ is $\frac{7}{8}$ of what number?
*163.* $4\frac{2}{3}$ is $\frac{7}{9}$ of what number?
*164.* $7\frac{1}{2}$ is $\frac{25}{16}$ of what number?
*165.* $18\frac{3}{4}$ is $\frac{5}{6}$ of what number?

## 38. A Fraction or a Mixed Number by a Mixed Number.

*166.* How many days will $11\frac{2}{3}$ lb. of meat last a family that uses $1\frac{3}{4}$ lb. daily? *Methods, page 180.*

*167.* How many jews-harps can be bought for $\$.18\frac{3}{4}$, at $\$.06\frac{1}{4}$ apiece?

*168.* At $\$6\frac{1}{2}$ a pair, how many pairs of boots can be bought for $\$45\frac{1}{2}$?

*169.* A boy can rake $2\frac{2}{3}$ acres of hay in a day. How long will it take him to rake $\frac{7}{8}$ of an acre?

*170.* How much clover seed can be bought for $\$\frac{3}{8}$, at $\$3\frac{1}{8}$ a bushel?

*171.* When cranberries are $\$9\frac{3}{4}$ a barrel, what part of a barrel can be bought for $\$2\frac{1}{4}$?

What is the quotient of

*172.* $\frac{1}{4}$ divided by $2\frac{3}{4}$?
*173.* $\frac{2}{5}$ divided by $3\frac{1}{2}$?
*174.* $6\frac{3}{4}$ divided by $16\frac{2}{3}$?

How many times are

*175.* $1\frac{1}{2}$ contained in $5\frac{1}{4}$?
*176.* $3\frac{3}{4}$ contained in $18\frac{1}{2}$?
*177.* $2\frac{2}{3}$ contained in $8\frac{1}{4}$?

*178.* A carman drew $13\frac{3}{4}$ T. of freight, taking $1\frac{3}{8}$ T. at a load. How many loads did he draw?

*179.* A wood sawyer sawed and split $12\frac{1}{3}$ cd. of wood in $6\frac{1}{6}$ days. How many cords did he average per day?

*180.* If $3\frac{3}{4}$ bu. of wheat cost $\$4\frac{7}{8}$, how much will 1 bu. cost?

*181.* How many hours will it take a canal-boat to run $21\frac{3}{4}$ miles, at the average rate of $2\frac{1}{2}$ miles an hour?

*182.* What part of a barrel of sweet-potatoes can be bought for $\$3\frac{1}{4}$, at $\$6\frac{7}{8}$ a barrel?

| How many times are | What part |
|---|---|
| *183.* $2\frac{3}{5}$ contained in $5\frac{1}{5}$? | *186.* Of $\$8\frac{1}{2}$ are $\$2\frac{1}{10}$? |
| *184.* $1\frac{3}{4}$ contained in $4\frac{7}{10}$? | *187.* Of $10\frac{1}{3}$ ft. are $2\frac{7}{12}$ ft.? |
| *185.* $3\frac{1}{16}$ contained in $8\frac{1}{4}$? | *188.* Of $4\frac{4}{15}$ h. are $1\frac{3}{5}$ h.? |

*189.* *When the divisor is a mixed number, what step is necessary, before performing the division?*

*190.* *Then, how is a mixed number or a fraction divided by a mixed number?*

*191.* A farmer cut $7\frac{1}{2}$ T. of hay from a meadow, that yielded $1\frac{3}{5}$ T. to the acre. How many acres were there in the meadow?

*192.* A hop grower picked $6\frac{3}{4}$ T. of hops, from a yard which averaged $1\frac{1}{3}$ T. to the acre. How many acres were there in the hop-yard?

*193.* What part of a basket of peaches can be bought for $\$1\frac{4}{5}$, at $\$3\frac{1}{8}$ per basket?

| How many times are | What is the quotient of |
|---|---|
| *194.* $\$1\frac{3}{5}$ contained in $\$12\frac{1}{2}$? | *196.* $\$1\frac{3}{5}$ divided by $\$12\frac{1}{2}$? |
| *195.* $2\frac{1}{2}$ yd. contained in $5\frac{3}{4}$ yd.? | *197.* $2\frac{1}{3}$ yd. divided by $5\frac{3}{4}$ yd.? |

## SECTION VII.

### *REVIEW PROBLEMS.*

1. Reduce $\frac{3}{6}\frac{3}{3}$, $\frac{1}{1}\frac{2}{2}\frac{8}{8}$, and $\frac{2}{3}\frac{4}{6}\frac{8}{8}$ to their lowest terms.
2. Reduce $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$ to similar fractions.
3. What is the common denominator of the least similar fractions to which fifths, eighths, and tenths can be reduced?
4. A grocer has $\frac{5}{1}\frac{5}{2}$ bar. of **A** sugar, $\frac{1}{3}\frac{5}{6}$ bar. of **B** sugar, and $\frac{5}{1}\frac{9}{2}\frac{0}{0}$ bar. of yellow sugar. Of what kind of sugar has he the most?
5. How many yards of Marseilles goods will be required for 3 doz. vests, allowing $\frac{3}{4}$ yd. to a vest?
6. Kate bought 10 yards of Scotch gingham, at \$.31$\frac{1}{4}$ a yard. How much did it cost her?
7. In a certain village there are 497 dwelling houses, and $\frac{2}{7}$ of them are of brick. How many brick houses are there in the village?
8. How many days are $\frac{3}{5}$ of a common year?
9. How much are the daily wages of a factory girl, who receives \$5 per week?
10. A young lady paid \$5 for 1 doz. handkerchiefs. What part of a dollar did each handkerchief cost?
11. At \$4 for 5 ducks, how much will 1 duck cost?
12. How many hours must a boy work to earn \$.75, at \$.10 an hour?

How much is

13. $\frac{1}{2}$ of 92 dozen?
14. $\frac{1}{3}\frac{1}{6}$ of \$82?
15. $\frac{7}{1}\frac{7}{5}$ of $\frac{4}{5}\frac{4}{5}$ of a box of soap?
16. $\frac{1}{2}$ of 999?
17. $\frac{1}{1}\frac{7}{0}\frac{7}{0}$ of 925?
18. $\frac{9}{1}\frac{9}{7}$ of $\frac{1}{6}\frac{1}{6}$?

19. One week a factory operative made only $\frac{7}{1}\frac{7}{2}$ of full time. How many days did he work?

20. A lady having $\frac{15}{16}$ of a pound of worsted, used $\frac{3}{5}$ of it in making a lamp mat. What part of a pound did she use?

21. I bought $\frac{4}{7}$ of a piece of carpeting which contained $61\frac{1}{4}$ yards, for a carpet. How many yards were there in the carpet?

22. A hardware dealer sold a keg of nails for $\$5\frac{7}{20}$, and his gain was $\$\frac{2}{3}$. How much did the nails cost him?

23. If I have $\$7\frac{9}{20}$, how much must I earn to have \$10?

24. If a farm hand earns \$9 in $\frac{15}{16}$ of a month, what are his monthly wages?

25. If 4 yards of silicia costs $\$\frac{2}{3}$, how much will 3 yards cost?

26. 10 is $\frac{5}{6}$ of some number; how much is $\frac{1}{6}$ of the number?

27. 12 is $\frac{6}{7}$ of some number; how much is $\frac{1}{7}$ of the number?

28. 20 is $\frac{5}{9}$ of some number; how much is $\frac{1}{9}$ of the number?

29. How much is $\frac{1}{11}$ of the number of which 120 is $\frac{12}{11}$?

30. How much is $\frac{1}{16}$ of the number of which 144 is $\frac{9}{16}$?

31. If 5 bushels of wheat cost $\frac{4}{5}$ of \$10, what will be the cost of 6 bushels?

32. If a barrel of flour is worth 12 times as much as a bushel of oats, and flour is $\$8\frac{1}{3}$ a barrel, how much are oats a bushel?

33. A driver paid $\$287\frac{1}{2}$ for two yoke of oxen. How much did he pay for 1 ox?

34. If a man's wages are \$9 a week, in how many weeks will he earn $\$33\frac{3}{4}$?

35. If two boxes of lemons cost $\$5\frac{1}{3}$, how many boxes can be bought for $\$16\frac{2}{3}$?

36. A drover, by selling a lot of sheep for \$25 above cost, gained $\frac{1}{4}$ of their cost. For how much did he sell the sheep?

37. My harness cost $31\frac{1}{4}$, which was $\frac{1}{3}$ as much as the cost of my cutter. What was the cost of both?

38. A mason used $12\frac{1}{2}$ bu. of sand in making a batch of mortar, using $1\frac{2}{3}$ bu. of sand to 1 bu. of lime. How many bushels of lime did he use?

39. $\frac{2}{3}$ of 12 are how many times 3?

40. $\frac{2}{3}$ of 27 are what part of 54?

41. $\frac{2}{3}$ of 27 are 3 times what number?

42. $\frac{2}{3}$ of 27 are $\frac{1}{2}$ of what number?

43. $\frac{2}{3}$ of 27 are $\frac{3}{4}$ of what number?

44. 48 are $\frac{1}{2}$ of what number?

45. A man paid $3\frac{3}{4}$ for a satin vest pattern, paying at the rate of $8\frac{1}{3}$ a yard. What was the length of the vest pattern?

46. A physician poured out $\frac{3}{8}$ gal. of wine from a gallon jug that was $\frac{1}{3}$ full. How much wine was then left in the jug?

47. I bought 3 T. of coal, and used $\frac{2}{3}$ T. one month and $\frac{9}{10}$ T. the next month. How much coal had I left?

48. A, B, and C together own a woolen factory. A owns $\frac{3}{7}$ of it, and B $\frac{4}{9}$ of it. What part of it does C own?

49. A man traveled $14\frac{1}{3}$ mi. by railroad, $64\frac{1}{8}$ mi. by steamboat, and far enough by stage to make the whole journey $108\frac{9}{10}$ mi. How far did he travel by stage?

50. What number must be added to the sum of $\frac{6}{7}$ and $6\frac{1}{3}$ to make $10\frac{1}{2}$?

51. From the sum of $\frac{1}{2}$, $\frac{2}{3}$, $\frac{5}{6}$, and $\frac{1}{3}$, subtract $1\frac{5}{6}$.

52. From $16\frac{1}{2}$ subtract the sum of $\frac{1}{4}$, $\frac{1}{3}$, and $10\frac{5}{6}$.

53. $\frac{3}{4} + 5\frac{1}{3}$ are how much less than $10 + 4\frac{1}{2}$?

54. What is the difference between $\frac{1}{2} + \frac{1}{3}$ and $\frac{1}{4} + \frac{1}{5}$?

55. 12 times $\frac{4}{5}\frac{5}{8}$ are $\frac{3}{4}$ of what number?

56. $\frac{5}{6}$ of 10 times $\frac{7}{10}\frac{3}{0}$ are $\frac{9}{10}\frac{5}{0}$ of what number?

57. How many yards of silk will a tailor use in facing 9 coats if he uses $\frac{1}{2}\frac{9}{7}$ of a yard for each?

58. $\frac{3}{4}$ of 12 are $\frac{4}{5}$ of what number?

59. $\frac{4}{5}$ of 15 are $\frac{3}{8}$ of what number?

60. $\frac{5}{8}$ of 24 are $\frac{4}{7}$ of what number?

61. $\frac{5}{4}$ of 48 are $1\frac{2}{7}$ of what number?

62. $\frac{4}{5}$ of 30 are $\frac{8}{9}$ of what number?

63. How many hours must a boy work to earn $\$\frac{3}{4}$ if he earns $\$\frac{3}{5}\frac{}{0}$ an hour?

64. At $12 a ton, how much will $\frac{8}{5}$ T. of hay cost?

65. If the materials for 7 gal. of wine cost $4, how much will they cost for 4 gal.?

66. If a man can saw and split 6 cd. of wood in 4 da., how long will it take him to saw and split 9 cd.?

67. How much will $8\frac{3}{4}$ lb. of candy cost at $\$\frac{2}{5}$ a pound?

68. What will be the cost of $12\frac{3}{8}$ yd. of carpeting, at $\$1\frac{3}{5}$ a yard?

69. James hoed a piece of corn in $5\frac{5}{6}$ da., hoeing $\frac{2}{5}$ A. each day. How many acres were there in the piece?

70. Farmer F. has 25 cows, and his neighbor G. has 5 less than $\frac{3}{5}$ as many. How many cows have both?

71. If a boy can pump $4\frac{1}{6}$ gal. of water in 1 minute, how many minutes will it take him to fill a tank which holds 155 gal.?

72. At $\$1\frac{2}{5}$ a basket, how many baskets of tomatoes can be bought for $\$9\frac{1}{7}\frac{}{0}$?

73. 48 is $\frac{4}{5}$ of how many times 10?

74. $\frac{5}{8}$ of 64 are $\frac{5}{9}$ of how many times 12?

75. $\frac{5}{8}$ of 64 are $\frac{5}{9}$ of how many times $\frac{1}{4}$ of 24?

76. $\frac{5}{8}$ of 64 are 4 times what part of 50?

# CHAPTER VI.

## CONVERSE OPERATIONS.

### SECTION I.

*ADDITION AND SUBTRACTION.*

1. The parts of a farm are 35 acres of tilled land, 17 acres of meadow, 25 acres of pasture, and 23 acres of woodland. How many acres are there in the farm?
2. A livery stable keeper in Chicago has 35 carriages, 16 of which are double carriages. How many single carriages has he?
3. Two pieces of cloth measure 37 yd. 1 qr., and one of them is 8 yd. 3 qr. long. What is the length of the other?
4. A woman went to a tea store with $2.15. She paid $.75 for 6 pounds of sugar, $.40 for 2 pounds of coffee, and the balance of her money for a pound of tea. How much was the tea a pound?
5. A miller had 269 bushels of wheat, but after grinding a part of it into flour, he finds he has 87 bushels remaining. How many bushels has he ground?
6. A Vermont farmer, after selling 208 sheep, has 432 remaining. How many sheep had he at first?

7. Joel is 5 ft. 2 in. high, and Jasper is 3 ft. 11 in. high. What is the difference in their heights?

8. What is the sum of $2\frac{1}{2}$ da., $5\frac{2}{3}$ da., $9\frac{1}{8}$ da., and $\frac{3}{4}$ da.?

Addition is putting parts together to form a whole, and subtraction is taking away a part or parts from the whole. Hence, addition is the reverse of subtraction.

*Converse Operations* are those arithmetical processes which are the reverse of each other.

9. The parts of a number are 15, 92, and 43. What is the number?

10. The sum of two numbers is 18 gal. 2 qt., and one of them is 4 gal. 3 qt. 1 pt. What is the other?

11. The sum of three numbers is $37\frac{1}{2}$; one of them is $18\frac{3}{4}$, and another is $12\frac{1}{2}$. What is the other number?

12. The minuend is 94, and the subtrahend is 48. What is the difference?

13. The minuend is $3\frac{1}{4}$, and the remainder is $2\frac{3}{8}$. What is the subtrahend?

14. The subtrahend is 10 lb. 4 oz., and the remainder is 5 lb. 6 oz. What is the minuend?

15. What is the difference between $\frac{1}{4}$ wk., and $\frac{1}{5}\frac{3}{4}$ wk.?

16. The greater of two numbers is \$3.15, and the less is \$1.27$\frac{1}{2}$. What is their difference?

17. The greater of two numbers is \$$3\frac{3}{10}$, and their difference is \$$1\frac{1}{5}$. What is the less number?

18. The less of two numbers is \$1.27$\frac{1}{2}$, and their difference is \$1.87$\frac{1}{2}$. What is the greater number? (See Manual, page 173.)

## SECTION II.

### *MULTIPLICATION AND DIVISION.*

1. How many square rods are there in a field $35\frac{2}{3}$ rd. long and 9 rd. wide?

2. In finding the cost of 30 barrels of apples, at \$2.12$\frac{1}{2}$ per barrel, which number is the multiplicand, which is the multiplier, and which is the product?

3. A grocer bought 10 barrels of potatoes containing 2 bu. 3 pk. each, and retailed them at $.60 a bushel. How much did he receive for them?

4. This year I gathered 7 times as many apples as pears from my garden, and I gathered 40 bu. 1 pk. of apples. How many pears did I gather?

5. A shoe dealer paid $300 for French calf boots, at $5 a pair. How many cases, of 12 pairs each, did he buy?

6. My garden contains $\frac{3}{8}$ A., and my door-yard $\frac{1}{16}$ A. My garden is how many times as large as my door-yard?

7. If $\frac{3}{5}$ of a pine-apple are divided among 5 children, what part of a pine-apple will each child have?

8. A woman put 4 gal. 1 qt. 1 pt. of catsup into pint and quart bottles, using 2 times as many of the latter as of the former. How many bottles of each size did she use?

9. A dressmaker used $11\frac{1}{4}$ yd. of poplin, in making the skirts of 2 walking-dresses, using $1\frac{1}{8}$ yd. for each breadth. How many breadths were there in each skirt?

10. A farmer finds that, if he divides his farm equally among his 6 children, each of them will have $56\frac{1}{4}$ acres of land. What is the size of his farm?

Multiplication is repeated addition of the same part or number, and division is repeated subtraction of the same part or number. Hence, multiplication is the reverse of division.

11. What is the product of 9 and 23? Of 9 times $2.30?

12. The multiplicand is 2 gal. 1 qt., and the multiplier is 9. What is the product?

13. Find the product of the factors 6, 5, and $3\frac{1}{3}$.

14. The product is $7\frac{1}{2}$, and one factor is 5. Find the other factor.

15. The product of three factors is $8\frac{3}{4}$, and two of the factors are $\frac{1}{4}$ and 14. What is the other factor?

16. The product is $6\frac{3}{4}$, and the multiplier is $\frac{3}{4}$. What is the multiplicand?

17. The multiplicand is 2 bu. 1 pk., and the product is 24 bu. 3 pk. What is the multiplier?

18. The divisor is 6, and the dividend is 29. What is the quotient?

19. The dividend is 29, and the quotient is $4\frac{5}{6}$. What is the divisor?

20. The divisor is 6, and the quotient is $4\frac{5}{6}$. What is the dividend?

## SECTION III.

### *CONVERSE REDUCTIONS.*

### 39. Denominate Fractions to Compound Numbers.

1. A MERCHANT bought two pieces of linen, paying $\$\frac{3}{8}$ a yard for one, and $\$\frac{9}{16}$ a yard for the other. How many cents a yard did each piece cost him?

(See Manual, page 173.)

2. Reduce $\frac{5}{8}$ gal. to quarts and pints. *Methods, page 180.*

3. What compound number is equal to $3\frac{7}{8}$ bu.?

4. How many inches is $\frac{1}{8}$ yd.? Is $\frac{1}{16}$ yd.? Are $\frac{1}{8}$ yd. + $\frac{1}{16}$ yd.?

5. The rows of vines in a grapery are $\frac{1}{2}$ rd. apart, and the vines in the rows are $\frac{1}{4}$ rd. apart. What is the distance in feet and inches between the rows?

6. What is the distance between the vines?

7. The fence which incloses my orchard is $\frac{7}{12}$ mi. in length. What compound number expresses the length of the fence?

8. How many square feet and square inches are there on the surface of a mirror, that is $1\frac{2}{5}$ yd. long and $\frac{2}{3}$ yd. wide?

9. How many cubic feet of bricks are there in $\frac{2}{3}$ cu. yd. of brick wall, if $\frac{1}{6}$ of the wall is mortar?

10. How many ounce bullets can be made from $2\frac{5}{8}$ lb. of lead?

11. I feed my cow $\frac{5}{16}$ cwt. of hay daily. How many pounds do I feed her?

12. If a locomotive burns $\frac{1}{50}$ T. of coal in running 25 mi., how many pounds does it burn?

13. A baker used $\frac{2}{7}$ bar. of flour in making 100 loaves of bread. How many pounds of flour did he use?

14. If 10 hours of work a day are full time, how much time will the hands work daily, in a factory that is running on $\frac{3}{5}$ time?

15. When the time of sunrise is $\frac{4}{9}$ of the time from midnight to midday or noon, at what hour and minute does the sun rise?

16. A stationer sold $\frac{7}{12}$ of a gross of steel pens. How many dozen pens did he sell?

17. A modiste used $\frac{8}{15}$ of a ream of manilla paper, in supplying her customers with patterns. How many quires and sheets did she use?

### 40. Compound Numbers to Denominate Fractions.

18. The value of the old New England shilling was $\$.16\frac{2}{3}$. What fraction of a dollar was it?

19. What fraction of a dollar were 7 New York shillings, or $\$.87\frac{1}{2}$?

20. One day a hotel cook used 1 pt. 3 gi. of molasses, in making fruit-cake. What part of a quart did she use? What part of a gallon?

*21.* 1 pk. 5 qt. of beans are what fraction of a bushel?
*Methods, page 180.*

*22.* Express 4 bu. 3 qt. 1 pt. by a mixed number.

*23.* $7\frac{1}{2}$ in. are what part of a foot?

*24.* What mixed number is equal to 72 rd. 4 yd. $1\frac{1}{2}$ ft.?

*25.* 2 sq. ft. 72 sq. in. are what fraction of a square yard

*26.* What fraction of an acre is a village lot, which is 4 rd. front and 9 rd. deep?

*27.* If 4 shingles, each 4 in. wide, are laid 6 in. to the weather, what part of a square foot do they cover?

*28.* A block of marble 2 by $2\frac{1}{2}$ by $1\frac{3}{4}$ feet, is what part of a cubic yard?

*29.* 60 lb. of wheat are a bushel. What part of a bushel are 48 lb.?

*30.* How much must I pay for 7 lb. 10 oz. of butter, at $.36 a pound?

*31.* One month a dairy-man made 43 lb. 12 oz. of cheese, from the milk of 1 cow. What part of a hundred-weight of cheese did he make?

*32.* If school is in session 5 days of the week, what part of the school week has passed, at noon, Thursday?

*33.* In 45° N. latitude, on the shortest days of the year, the sun is above the horizon 8 h. 40 min. What part of the 24 h. is day, and what part is night?

*34.* One season Hudson River was closed by ice for 4 mo. 12 da. What fraction of a year was the river closed? What part of a year was it open?

*35.* A grocer having 1 gro. of boxes of matches, sold 6 doz. and 9 boxes of them. What part of the whole gross did he sell?

*36.* A printer used 13 quires 8 sheets of paper, in printing handbills. What part of a ream did he use?

# CHAPTER VII.

# PERCENTAGE.

## SECTION I.

### 41. *DEFINITIONS AND NOTATION.*

THE term *Per Cent* in business transactions signifies hundredths of any thing or number. Thus, 1 per cent is one hundredth, or 1 of every hundred; 6 per cent is 6 hundredths, or 6 of every hundred; $16\frac{2}{3}$ per cent is $16\frac{2}{3}$ hundredths, etc.

1. How many hundredths of a number is 1 per cent of it? How many hundredths are 2 per cent of it? Are 3 per cent? 5 per cent? 7 per cent? 8 per cent? 10 per cent?
2. What fraction in its lowest terms expresses 15 per cent, or 15 hundredths?
3. 25 per cent of a number is what part of it? 50 per cent? 75 per cent? (See Manual, page 173.)
4. $6\frac{1}{4}$ per cent of a number is what part of it? $8\frac{1}{3}$ per cent is what part? $12\frac{1}{2}$ per cent is what part?
5. What part of a number is $16\frac{2}{3}$ per cent of it? What part is $66\frac{2}{3}$ per cent of it?
6. What part of a number is 100 per cent of it? Is 125 per cent of it?
7. What fraction expresses 150 per cent of a number? 110 per cent? 140 per cent? $112\frac{1}{2}$ per cent? $133\frac{1}{3}$ per cent?
8. What part of a number is $\frac{1}{2}$ per cent of it? Is $\frac{1}{4}$ per cent? $\frac{1}{3}$ per cent? $\frac{1}{10}$ per cent? $\frac{1}{5}$ per cent? $\frac{1}{8}$ per cent?

9. What part of any number is $\frac{3}{4}$ per cent of it? Is $\frac{2}{5}$ per cent? $\frac{7}{10}$ per cent? $\frac{3}{8}$ per cent? $\frac{5}{8}$ per cent?

*Rate,* or *Rate Per Cent,* is the number which expresses the per cent, or number of hundredths.

The term *Percentage* has two significations:

1st. It is the process of finding any per cent of a number;

2d. It is the name of the result of the computation.

The *Base* is the number on which the percentage is computed.

The *Amount* is the base plus the percentage.

The *Difference* is the base minus the percentage.

The *Commercial Sign,* %, signifies per cent.

EXAMPLE.—24% of 50 cords of wood is .24, or $\frac{24}{100}$, of 50 cords, or 12 cords. In this example, 24% is the *rate;* 50 cords, the *base;* 12 cords, the *percentage;* 62 cords (= 50 + 12), the *amount,* and 38 cords (= 50 — 12), the *difference.*

Per cent may be applied to any number, great or small, concrete or abstract. Thus,

40 per cent of 1 bushel = .40 bu. = $\frac{40}{100}$ bu. = $\frac{2}{5}$ bu.;
88 " " 27 miles = .88 = $\frac{88}{100}$ = $\frac{22}{25}$ of 27 mi.;
14½ " " 395 days = .14½ = $\frac{29}{200}$ of 395 da.;
7 " " $85.42 = .07 = $\frac{7}{100}$ of $85.42;
65 " " 93¼ = .65 = $\frac{65}{100}$ = $\frac{13}{20}$ of 93¼.

## SECTION II.

### *THE FIVE GENERAL CASES OF PERCENTAGE.*

### 42. Base and Rate given, to find Percentage.

1. How much is 6% of $100?
2. A man bought a horse for $125, and paid 20% of it down. How much money did he pay down?
3. A farmer raised 500 bu. of corn, and sold 25% of it. How many bushels did he sell? *Methods, page 180.*

4. $12\frac{1}{2}\%$ of an army of 90,000 men were killed and wounded in an engagement. How many were killed and wounded?

5. From a yard containing 150 cattle, $66\frac{2}{3}\%$ were sold on the first market day. How many were sold?

6. A fruit grower sent 75 baskets of peaches to market, but before they were sold, 8% of them were spoiled. How many baskets did he lose?

How much is

| | |
|---|---|
| 7. 5% of 140 cd. of wood? | 10. $12\frac{1}{2}\%$ of \$75? |
| 8. 8% of 250 yd. of sheetings? | 11. 30% of 190 mi.? |
| 9. 3% of 50 thousand shingles? | 12. 55% of 230 bu.? |

### 43. Base and Percentage given, to find Rate.

13. A sewing-machine which cost \$100, was sold for \$80. What % of the cost did it sell for?

14. A sheep grower having 450 sheep, sold 150 of them. What % of his flock did he sell? *Methods, page 180.*

15. A boy having 15 apples, gave away 3 of them. What % of his apples did he give away?

16. A man having \$50, paid out \$10 of it for provisions. What % of his money did he expend?

17. A landlord rents a house worth \$1,250, for \$150 a year. What % on its value does the house rent for?

18. A farmer pays \$3 per acre, for the use of land valued at \$50 per acre. What % on the value of the land, does he pay for the use of it?

19. What % of 500 bu. are 50 bu.?

20. What % of 75 melons are 15 melons?

21. \$119 are what % of \$340?

22. 1 bu. 3 pk. are what % of 6 bu. 1 pk.?

23. $\frac{3}{4}$ of an hour are what % of $\frac{5}{8}$ of an hour?

### 44. Rate and Percentage given, to find Base.

24. From a certain regiment, 100 men are detailed on picket duty, and the number detailed is 12½ % of the whole number who are fit for duty. How many men of that regiment are fit for duty?

25. A gentleman sold his house and lot for 25% above cost, and made $500. How much did the property cost? *Methods, page 180.*

26. From 1 day's sales a merchant received $133, which was 7% of his weekly sales. How much were his receipts for the week?

27. A farmer carried to mill 10 bushels of wheat, which was ½% of his whole crop. How many bushels did he raise?

28. This year a hop grower sold his hops at 24 cents a pound, which was 80% of the price he received last year. At what price did he sell his crop last year?

29. A certain school closed its winter term with 115 pupils, which was 92% of the number with which the term commenced. With how many pupils did it commence?

30. $600 are 6% of what sum of money?

31. 800 is 10% of what number?

32. 1,500 is 33⅓% of what number?

### 45. Base and Rate given, to find either Amount or Difference.

33. If maple wood is worth 20% more than oak, and oak sells at $7.50 per cord, how much is a cord of maple worth? *Methods, page 180.*

34. A gentleman having $600, paid 20% of it for a gold watch. How much had he remaining?

35. A gentleman having $750 deposited in a bank, checked out 33⅓% of it. How much remained on deposit?

36. A merchant bought Merrimac prints at 20 cents a yard, but the next year he was obliged to pay 37½% more for the same class of goods. How much did he pay per yard?

37. A merchant started in business with a capital of $2,400, and added to it 33⅓% in two years. What was his capital at the expiration of the second year?

38. The base is 25, and the rate is 25%. What is the amount? What is the difference?

39. Find the amount, and also the difference, when the base is ¼ and the rate is 8⅓%.

### 46. Amount or Difference and Rate given, to find Base.

40. A speculator bought cheese at two factories, buying 9,000 lb. at one, which was 50% more than he bought at the other. How much did he buy at the second factory? *Methods, page 180.*

41. A man on a journey traveled 12½% of the whole distance by stage, and the remainder, which was 140 miles, by railroad. How many miles did he travel?

42. A widow expended 25% of her income for her support, and saved $60 a month. What was her income?

43. A physician's practice is worth 50% more this year than it was last, and this year it is worth $2,700. How much was his practice worth last year?

44. 87 cows are 116% of how many cows?

45. 1 lb. 11 oz. are 112½% of what number?

46. $44 are 22% of how many dollars?

47. 57 ft. are 95% of how many feet?

# SECTION III.

## *SPECIAL APPLICATIONS OF THE FIVE GENERAL CASES.*

### 47. Insurance.

*Insurance* is a security against loss or damage within a given time, guarantied to one party by another, for a specified consideration.

*Valuation* is the sum for which property, life, or health is insured.

*Premium* is the sum paid for the insurance.

The *Policy* is the contract between the insurer and the insured.

In computations in insurance, valuation is the base, premium is the percentage, and rate % is the rate.

1. At 1% premium, how much must be paid for an insurance of $600 on a quantity of grain?
2. A gentleman effected an insurance of $1,500 on his house, at 2% premium. How much did he pay for his policy?
3. A cabinet maker paid 4% for an insurance of $3,000 on his stock and shop. How much did the insurance cost him?
4. What must be paid for an insurance of $5,000 on a stock of goods, at 1½%?
5. A produce dealer paid $25 for an insurance of $5,000, on a cargo of produce. What % premium did he pay?
6. A hardware merchant paid an insurance agent $50 premium, for a policy of $2,500, on a stock of stoves. What % did he pay?
7. What % premium does that man pay, who pays $9 for a policy of $1,200, on his house and furniture?

8. If a lawyer pays $15 for an insurance on his clothing and library, at $\frac{5}{8}\%$, what amount does he get insured?

9. A farmer paid an agent $8 for insuring his barn and its contents, at $\frac{1}{2}\%$. What amount did he get insured?

## 48. Commission.

An *Agent, Commission Merchant, Factor,* or *Broker* is a person who, by authority, buys and sells goods, or transacts other financial business for another.

A *Principal* is the person or party for whom an agent transacts business.

*Commission* is the sum paid an agent or commission-merchant for transacting business.

In computations in commission, the sum expended or collected by the agent, for the principal, is the base; commission is the percentage; rate % is the rate; and the sum on which commission is computed, plus the commission, is the amount.

10. A person collects accounts amounting to $500, and receives 10% on the money collected for his services. How much does he receive?

11. An agent in New York buys goods to the amount of $3,000, and receives 5% commission. How much does he receive?

12. A planter sends 40,000 lb. of cotton to his correspondent in New York, who sells it at 15 cents a pound, and retains $2\frac{1}{2}\%$ commission. How much does the planter receive?

13. A collector's fees are 1% on all sums paid to him within 30 days after receiving his warrant, and 5% on all amounts collected thereafter. The taxes of his town are $15,000, $5,000 of which are paid within the 30 days, and the balance thereafter. What are his fees for collecting?

*14.* A druggist sent his broker $630 with which to buy goods, after deducting his commission of 5%. How much did the broker expend for goods?

*15.* A manufacturer sends to a wool broker $2,600 with which to purchase wool, allowing him 2% brokerage on the money paid out. How much money will the broker expend for wool?

*16.* A book buyer in New York receives $800 to expend for books for a library, after deducting his commission of 12½%. How much will he expend?

*17.* A brewer allows 4% for buying hops, and sends his broker $5,200. How many pounds of hops, at 25 cents a pound, will he receive?

*18.* A collector received $40 for collecting bills, at 5% commission. How much money did he collect?

*19.* A horse dealer received $15 for selling a horse, which was 10% of his value. For how much was he sold?

## 49. Profit and Loss.

*Profit,* in business, is the sum above cost for which goods are sold.

*Loss* is the sum below cost for which goods are sold.

In computations in profit and loss, the cost is the base; the profit or loss is the percentage; the rate % is the rate, and the selling price is the amount or difference.

*20.* Last year a farmer had 450 sheep, and his flock has increased 30% in the year. How many more sheep has he than he had last year?

*21.* A hen hatched a brood of 15 chickens, but lost 40% of them. How many chickens did she lose?

*22.* A grocer sold white-fish that cost $16 a barrel, at 50% profit. How much did he gain on a pound?

23. The bread made from a barrel of flour weighs 40% more than the flour. How many pounds more does it weigh?

24. A man sold a city lot which cost him $160, at an advance of 212½%. How much did he gain?

25. A cord of green beech wood weighs 6,000 lb., and it loses 27% of its weight in seasoning. How much lighter is a cord of dry beech than a cord of green?

26. A merchant sold broadcloth that cost him $5¼ a yard, at a loss of 33⅓%. How much did he lose on a yard?

27. A grocer buys sugar at $.10 a pound, and sells it at a profit of 30%. For how much does he sell it?

28. I bought 6 cords of wood for $10. At what price per cord must I sell it, to make 20%?

29. A grocer sold tea that cost him $.78 a pound, at a loss of 15%. What did he get a pound for it?

30. A speculator bought butter at $.35 a pound, but was obliged to sell it at a loss of 12½%. For how much did he sell it?

31. A gentleman bought a house and lot for $1,600, paid 10% for repairs and painting, and sold it for 15% profit. How much did he get for it?

32. A manufacturer finds that it costs him $1.20 a yard to manufacture his cloth, and he wishes to sell it at a profit of 25%. How much will he make a yard, and how much a yard will he sell it for?

33. A gentleman sold a horse and harness for $180, which was 10% less than cost. How much did they cost him?

34. A manufacturer sold damaged cloth at cost, or $1.50 a yard, which was 33⅓% below the marked price. What was the marked price?

35. A silversmith sold tea-spoons at $1.65 each, and made 25%. How much did they cost him?

36. A jeweler sold a watch for $69, which was 15% advance on the cost. How much was the cost?

37. A grocer bought sugar at $.08 a pound, and sold it at $.10. What % did he make?

38. A book-seller sold a book for $1.00, that cost him $.75. How much % did he make?

39. A carman sold a truck for $87½, which cost him $100. At what % less than cost did he sell it?

40. A flour dealer bought flour for $6 a barrel, and sold it for $7. What % did he make?

41. What % does a grocer make, by selling eggs at ⅘ of their cost?

42. If kerosene is bought at ⅚ of the market price, and sold at 10% below the market price, what % is lost?

## 50. Stocks.

A *Corporation* is a company established by law, having power to transact business as an individual.

*Stock* is the property invested in the business of a corporation.

A *Share* is one of the equal parts into which the stock of a corporation is divided. It is usually $100.

The *Par Value* of stock is the sum stated in the certificate; and

The *Market Value* is the sum for which it will sell.

Stock is *At Par* when the market value is the par value, or 100%.

Stock is *Above Par* when the market value is above the par value, or more than 100%; and

Stock is *Below Par* when the market value is below the par value, or less than 100%.

*Premium* is the excess over 100% in the value of stock that is above par; and

*Discount* is the deficiency under 100% in the value of stock that is below par.

A *Stock Broker* or *Stock Jobber* is a person who deals in stocks.

*Brokerage* is the commission paid to stock brokers for buying and selling stocks for others.

In computations in stocks, the par value is the base, the premium or the discount is the percentage, the rate % is the rate, and the market value is the amount or difference.

43. A stock jobber bought $3,000 worth of R. R. stock, and sold it at a loss of 10%. How much did he lose?

44. For how much did he sell it?

45. If silver is at a premium of 15%, how much currency will a man have to pay for $50 in silver?

46. A broker paid $2,900 in bills for gold, when gold was at a premium of 45%. How much gold did he buy?

47. He sold his gold at a premium of 56%. How much did he make in the two transactions?

48. What is the market value of a share of mining stock, that sells at 32½% below par?

49. A broker received $1,750 for 15 shares of insurance stock. What was the market value of a share?

50. A man paid $262½ for stock in a toll-bridge, at 12½% discount. How many shares did he buy?

## 51. Taxes.

*Taxes* are sums of money assessed upon persons and property, to meet public expenses.

Property is of two kinds: *Real Estate,* or houses and lands; and

*Personal Property,* or movable property.

In computations in taxes, the valuation of property is the base; the rate % is the rate; and the tax is the percentage.

51. A tax of $250 was levied on a village, in which the real estate was assessed at $19,000, and the personal property at $6,000. What was the rate % of tax?

52. The taxable property in a certain school district is valued at $20,000, and a tax of $50 is voted to repair the school-house. What is the rate % of the tax?

53. A's property is assessed at $2,500. How much is his tax?

54. B is assessed for $3,000. How much is his tax?

55. C is assessed for $4,500. What is his tax?

56. How much is D's tax, his property being assessed at $1,500?

57. E is assessed for $8,500. How much must he pay?

58. A machine costing $150, is put into a planing-mill owned by 8 men, whose shares of the capital are, respectively, $600, $400, $1,200, $500, $1,500, $800, $300, and $2,200. How much of the cost of the machine must each partner pay?

## SECTION IV.

### *INTEREST.*

*Interest* is the sum paid for the use of money.

*Principal* is the sum for the use of which interest is paid.

*Amount* is the sum of principal and interest.

*Rate per Cent per Annum* is the interest on $1 for 1 year.

In computations in interest, principal is the base; the product of rate % per annum and time expressed in years, is the rate; and interest is the percentage. Interest is the product of the three factors, principal, rate, and time.

### 52. Interest for Years, or Months, or Days.

1. What is the interest of $75 for 2 years, at 6%?
2. What is the interest of $500 for 3 years, at 7%?
3. A gentleman has a mortgage for $1,000, due in 4 years, at 7%. How much interest will he receive?
4. A man purchased a city house and lot for $4,500, paying $1,500 in cash, and giving a mortgage for the balance due in 5 years, at 8%, interest payable annually. How much interest did he pay yearly?
5. How much money, principal and interest, did he pay for the property?
6. What part of a year is 1 month? Are 2 months? 6 months? 8 months?
7. 9 months are what part of a year? 4 months? 7 months?
8. The interest of any sum of money for 10 months will be what part of the interest of the same sum for 1 year?
9. The interest for 5 months will be what part of 1 year's interest?
10. What is the interest of $450 for 4 months, at 8%?
11. At 7%, what is the interest of $50 for 3 months?
12. What part of the principal will equal the interest for 9 months, at 6%?
13. How much interest must be paid for the use of $120 for 10 months, at 7%?
14. What part of a month, or 30 days, is 1 day? Are 6 days? 8 days? 10 days? 20 days?
15. 14 days are what part of a month? 15 days? 24 days?
16. The interest of any sum of money for 25 days will be what part of the interest of the same sum for 1 month?
17. What part of the interest for 1 month is the interest for 18 days? Is the interest for 12 days? For 28 days?
18. What is the interest on a note for $75, due in 15 days, at 6%?

*19.* I borrowed \$150 for 3 weeks, at 10%. How much interest did I pay?

*20.* At 24% per annum, what is the rate % per month? Per day?

*21.* A broker loaned \$750 for 18 days, at 2% per month. How much interest did he receive?

### 53. Interest for any Given Time.

*22.* What part of a year are 7 mo. 15 da.? 4 mo. 24 da.?

*23.* The interest of any sum of money for 6 mo. 18 da. will be what part of the interest of the same sum for 1 year?

*24.* How much interest has accrued on an account of \$45, which has been due 2 yr. 6 mo., at 6%?

*25.* At 7%, how much must I pay for the use of \$150 for 1 yr. 4 mo.?

*26.* What is the interest of \$750 for 3 mo. 6 da., at 6%?

*27.* A mechanic while building a house, borrowed \$380 for 7 mo. 15 da., at 8%. How much interest did he pay?

*28.* How much will \$30 gain in 2 yr. 2 mo. 20 da., at 6%? To how much will it amount?

*29.* At $\frac{3}{4}$% a month, how much will a banker receive for the use of \$100, for 2 yr. 5 mo. 10 da.?

*30.* Find the interest of \$150 for 1 yr. 6 mo. 12 da., at 15%.

*31.* How much interest has accrued on a mortgage for \$300, which has been running 4 yr. 4 mo. 15 da., at 7%?

*32.* A man paid 6% interest on a note for \$450, which had been due 2 yr. 10 da. How much interest did he pay?

### 54. Converse Operations in Interest.

33. At what % will $50 gain $15 interest in 7 yr. 6 mo.?
34. At what per cent will $30 gain $4.20 interest in 1 yr. 9 mo.? (See Manual, page 173.)
35. If I pay $54 for the use of $200 for 3 yr. 4 mo. 15 da., what per cent do I pay?
36. At what % will $50 amount to $60.50 in 3 years?
37. If the amount of $250 for 4 years is $310, what is the rate of interest?
38. If I loan $500, and at the end of 2 yr. 6 mo. receive $587.50, what rate of interest do I receive?
39. If the interest on $25 for 20 years is $25, what is the rate %?
40. At what per cent will $75 gain $75 interest in 1 year?
41. At what per cent will any given principal double itself in 10 years? In 12½ years?
42. At 6%, what principal will gain $24 in 8 years?
43. What principal will gain $28 in 8 years, at 7%?
44. What sum will earn $35 interest in 4 years, at 5%?
45. At 1½% a month, what principal will gain $300 interest in 5 yr. 6 mo. 20 da.?
46. What principal will amount to $171 in 2 yr., at 7%?
47. What sum of money put at interest at 4% for 7 yr. 6 mo., will amount to $52?
48. At 5%, what principal will amount to $480 in 4 years?
49. The time is 10 yr. 8 mo., the rate is 6%, and the amount is $82. What is the principal?
50. In what time will $90 gain $10.80, at 6%?
51. In what time will $125 gain $25, at 5%?
52. For how long a time must $75 be at interest, at 4%, to gain $16?

53. In what time will any sum of money double itself, at 5%? At 6%? At 7%? At 8%? At 10%?

54. For how long a time must $250 be at interest, at 6%, to amount to $300?

55. In what time will $64, at 7%, amount to $76.20?

## SECTION V.

### *DISCOUNT.*

### 55. Commercial Discount, or Per Cent Off.

The *Face* of an obligation is the sum to be paid when the obligation is due.

*Commercial Discount,* or *Per Cent Off,* is a deduction from the face of the obligation, of some % agreed upon, without regard to time.

In computations in commercial discount, invoice price, or the face of the obligation, is the base; rate % off is the rate; and the commercial discount is the percentage.

1. I bought articles that I retailed at $1.00, at $\frac{1}{3}$ off. What % did I make?

2. A book-seller buys books that retail at $.80, at $\frac{1}{4}$ off. What % does he make?

3. A merchant bought linen which retailed at $.50 a yard, at 50% off. What % did he make, by selling it at the regular price?

4. The proprietor of a variety store buys toys that retail at $.12, at $\frac{1}{6}$ off. What % does he make?

5. A stationer buys ink that retails at $.10 a bottle, at 20% off. What % does he make?

6. A merchant bought $4,000 worth of goods, on a credit of 6 months, but got a discount of 5% off for cash. What was the cash cost of his goods?

7. If goods are sold at 100% less than cost, how much do they bring?

8. If slates are sold at wholesale, at 40% off from retail or list prices, and a further discount of 5% off is made for cash, what is the total % off from list prices, for cash?

9. Which is the better, to buy goods at 30% off and 5% off for cash, or to buy at 5% off and 30% off for cash?

## 56. True Discount.

*Discount* is a sum deducted for the payment, before it becomes due, of a note or other debt not drawing interest.

*Present Worth*, or *Proceeds*, is the face of an obligation less the discount.

In computations in a discount, present worth or proceeds is the base; the product of the rate per cent per annum and the time expressed in years, is the rate; the face of the obligation is the amount; and the discount is the percentage.

10. How much must be discounted for the present payment of a note for $84, due in 2 years, money being worth 6%?

11. I bought a note for $207, due in 6 months, at 7% discount. How much did I pay for it?

12. A man sold property for $1,025, taking notes due in 3 months, and then sold the notes at 10% discount for cash. How much discount did he give? How much cash did he receive?

13. A broker bought a note for $412, due in 2 months, at a discount of $1\frac{1}{2}$% a month. How much did he pay for it?

14. I owe $530, due in 4 mo. 15 da., and I find I can buy the debt at 16% discount for cash. How much cash will pay the debt?

## SECTION VI.

### *REVIEW PROBLEMS.*

1. Only $\frac{5}{6}$ of a certain regiment are fit for duty. What % are on the sick list?
2. A teacher, whose salary is $800 a year, expends $700 in support of his family. What % of his salary does he save?
3. A father gave to each of 2 sons 25% of a farm containing 500 acres. How much land was given away, and how much had he remaining?
4. A farmer bought a cow for $60, and sold her so as to gain 20%. How much did he gain?
5. The interest received on $1,000 for 10 years was $\frac{7}{10}$ of the principal. What was the rate % of interest received?
6. Two regiments went into battle with 800 men each. After the battle, one mustered 625 men, which was 25% more than the other mustered. How many men did the second regiment muster?
7. A produce dealer sends to his factor in Boston 25,000 lb. of butter, which he sells at $.20 a pound, and charges 7% commission and guaranty. How much does the dealer receive for his butter?
8. A grape-grower refused $.15 a pound for his grapes, but afterward sold them at $16\frac{2}{3}$% less. How much did he get a pound for them?
9. A book-seller sold goods to the amount of $900 in one month, at an average profit of 25%. What was the cost of his goods?
10. At what % will $75 amount to $87 in 4 years?

*11.* A steam-boat is owned by 5 men, A owning 75 shares, B 100 shares, C 150 shares, D 200 shares, and E 275 shares. An assessment of $4,000 is made for repairs. How much must each stockholder pay?

*12.* What principal will gain $76 in 6 yr. 4 mo., at 6%?

*13.* If I receive $2,736 for 24 shares of bank stock, what is the value of 1 share?

*14.* At 8%, in how long a time will the interest on $30 amount to $12?

*15.* At 6¼%, in how long a time will $144 amount to $149.50?

*16.* A grocer buys molasses, which retails at $.80 a gallon, for 20% off. What % does he make?

*17.* 14⅜ per cent is what fraction of a number?

*18.* A policy of $150,000 was obtained on a vessel and cargo, for the voyage, at $\frac{5}{6}$%. How much was paid for the insurance?

*19.* A country merchant has $\frac{2}{5}$ of his capital invested in dry goods, $\frac{3}{10}$ of it in groceries, $\frac{1}{5}$ in hardware, and the balance in crockery. What % of his capital is invested in each of these classes of goods?

*20.* In the year 1863, a merchant sold cotton goods at 33⅓% above cost, and received $.36 a yard for them. How much did they cost him per yard?

*21.* If I burn 4 T. of coal during the summer months, and what I burn in the summer is 75% of as much as I burn in the winter, how much coal do I burn in a year?

*22.* A fruit dealer sold 10 baskets of peaches, that cost $1.25 per basket, at 12½% below cost. How much did he lose on them?

23. A merchant bought cassimere, at auction, at 28$\frac{4}{7}$% below the manufacturer's price, paying $1.25 a yard for it. He retailed it at 32% above manufacturer's price. What was his retail price?

24. A stationer sold paper that cost him $.75 a ream, for $1.50. What % profit did he make?

25. A boy bought apples at the rate of 3 for 5 cents, and sold them at the rate of 2 for 3 cents. What % did he make?

26. A dairy-man contracted his cheese at $.15 a pound, but at the time of delivery this price was 25% below the market price. What was the market price?

27. An importer in Philadelphia, who pays 16$\frac{2}{3}$% for buying and insurance, remits to his agent in London $5,684. How many dollars' worth of goods ought he to receive?

28. If gold is at a premium of 17$\frac{1}{2}$%, how much currency will a man receive for $80 in gold?

29. How much are 5 shares of bank-stock worth, at 18$\frac{3}{4}$% advance?

30. A Louisiana planter paid a New Orleans merchant an account of $450, which had been due 3 yr. 7 mo. 6 da. What was the interest on the account, at 5%?

31. If I receive $63 interest for the use of $250 for 4 yr. 2 mo. 12 da., what per cent do I receive?

32. At what per cent will any given principal double itself in 14$\frac{2}{7}$ years? In 16$\frac{2}{3}$ years? In 8$\frac{1}{3}$ years?

33. The time is 5 yr. 3 mo., the rate is 8%, and the interest is $84. What is the principal?

34. A man loaned $150 for a certain time, at 7%, and received $42 for the use of the loan. For how long a time was it at interest?

# CHAPTER VIII.

## MISCELLANEOUS PROBLEMS.

1. A MAN bought a wagon for $43, and after paying $9 for having it painted, he sold it at a gain of $6. How much did he get for it?

2. The parts are 70, 9, 3, 8, and 6. What is the sum?

3. A grocer who had 100 sacks of flour on hand in the morning, sold 9 sacks in the forenoon, and 6 in the afternoon. How many sacks had he left at night?

4. Eunice was 7 years old 9 years ago. Marion is 6 years older than Eunice, and 8 years older than Ruth. How old is Ruth?

5. A cotton broker sold to one merchant 56 bales of cotton, to another 67 bales, and to another 19 bales less than to the first. How many bales did he sell in all?

6. A drover bought 37 head of cattle on Monday, 20 head more on Tuesday than on Monday, and 18 head more on Wednesday than on Tuesday. How many cattle did he buy?

7. Silas lives 81 rods nearer school than Ernest. If they start from home at the same time, Silas walking 9 rods and Ernest 12 rods a minute, they will reach the school-house together. How far does each live from school?

8. If 3 men can chop 12 cords of wood in 2 days, how much can 1 man chop in 1 day?

9. If a man can earn $75 in 3 months, how many months will it take him to earn $200?

10. I have two farms, that, together, contain 134 acres, and one contains 14 acres more than the other. How many acres would there be in the two farms, if each was of the size of the smaller? How many acres are there in the smaller farm? How many acres in the larger?

11. A grocer has 75 pounds of tea in two chests, one of which contains 15 pounds more than the other. How many pounds are there in each chest?

12. Two men earn $60 in a week, and one of them earns $10 more than the other. How many dollars does each man earn?

13. Upon a vessel are 105 persons, and the number of passengers is 13 more than the number in the crew. How many passengers are there aboard the vessel?

14. Ida's grandmother is 65 years older than she, and the sum of their ages is 87 years. How old is each?

15. The sum of two numbers is 98, and their difference is 44. What are the numbers?

16. The sum of two numbers is 133, and their difference is 97. What are the numbers?

17. I have 49 cents. If I give to each of 5 boys as many cents as I can, how many cents will I have left?

18. Into how many 10-acre lots can a farm of 87 acres be divided?

19. How many plows, at $7 apiece, can be bought for $60?

20. At $9 apiece, how many bureaus can be bought for $100?

21. A farmer having 98 gallons of cider, filled as many 10-gallon kegs as he could, and sold the rest at 26 cents a gallon. How many kegs of cider had he, and how much did he receive for what he sold?

22. How many weeks and days are 100 days? Are 150 days?

23. What is the width of a room which requires 8 breadths of Brussels carpeting to cover the floor, each breadth being 2 ft. 3 in. wide?

24. If a horse eats 6 qt. of oats in a day, how many days will 7 bu. 4 qt. last him?

25. A gardener sold 5 bu. 3 pk. of tomatoes, at $.60 a peck. For how much did he sell them?

26. If 2 sq. rd. of land yield 3 bu. of potatoes, how many bushels will 1 A. 50 sq. rd. produce?

27. How much will 2 lb. 11 oz. of butter cost, at $.48 per pound?

28. A tailor bought 11 gross 3 dozen of buttons, and used 7 gross 9 dozen of them. How many buttons had he left?

29. Nancy covered a box which was 10 inches long, 6 inches wide, and 8 inches deep, with gilt paper. How many square inches of paper did she use?

30. The front wall of a brick house is 25 feet long, 20 feet high, and 1 foot thick. How many cubic feet does it contain, allowing 7 cubic yards for the openings for doors and windows?

31. How much will 1 ream of paper cost, if 10 sheets are worth 7 cents?

32. If mackerel are worth 13 cents a pound, how much will a barrel sell for?

33. If 2 sq. rd. of land yield 3 bu. of potatoes, how many bushels will 1 A. 50 sq. rd. produce?

34. If a farmer sows 14 pounds of clover seed to the acre, how many acres can he sow with 2 bushels 20 pounds, allowing 60 pounds to the bushel?

35. If you can count 90 eggs in one minute, how many dozen can you count in an hour?

36. A tinsmith made a 3-gallon rectangular can, which was 7 by 9 inches on the bottom. How many inches deep was it, there being 231 cubic inches in a liquid gallon?

37. If a wheel is 5½ yards in circumference, how many times will it revolve in going a mile?

38. How much will be the expense of plastering a ceiling 27 feet long, and 24 feet wide, at $1 for every 3 square yards?

39. What is the cost of 2 A. 80 sq. rd. of land, at $50 an acre?

40. How many cubic feet are there in a stick of timber 16 inches wide, 9 inches thick, and 13 feet long?

41. A publisher uses 6 sheets of book paper for one copy of a book that contains 288 pages. How many copies can he make from 10 reams?

42. How many days are there in the first 3 months of a common year? Of a leap-year?

43. How many days from Apr. 1 to Aug. 1 in any year?

44. A merchant buys a bill of goods, Jan. 1, on 60 days' credit. When is the payment due?

45. On the 20th day of Sept. a man sold a village lot, which was to be paid for in 4 months 15 days. On what day was the payment due?

46. $45 are $\frac{3}{5}$ of the cost of 9 yd. of velvet. At what price per yard must it be sold, to gain 20%.

47. When potatoes sell at $1\frac{3}{4}$ per barrel of 2 bu. 3 pk., how much is a bushel worth?

48. A farmer having 77 bu. of greenings, kept $\frac{4}{7}$ of them, and sold the remainder at $3.12\frac{1}{2}$ per barrel. How much did he receive for them?

49. $\frac{2}{3}$ of 3 times $\frac{2}{5}\frac{4}{0}$ are $\frac{8}{9}$ of what number?

50. $\frac{8}{9}$ of 6 times $\frac{3}{4}\frac{6}{8}\frac{0}{0}$ are $\frac{5}{2}\frac{}{4}$ of what number?

51. A boy gave 2 cents more than $\frac{1}{3}$ of his money for peaches, 1 cent more than $\frac{1}{2}$ of the remainder for marbles, and had 4 cents left. How much money had he at first?

52. If a boarding-house keeper uses on an average 10 lb. of flour a day, how many barrels will he use in 14 weeks?

53. If a farmer's family use 8 lb. of pork a week, how many barrels will they use in 50 weeks?

54. A farmer drew 4 loads of hay, which weighed respectively 18 cwt., 1 T. 3 cwt., 1 T. 2 cwt., and 17 cwt. How much hay did he draw?

55. A market gardener sowed a field of $4\frac{1}{2}$ A. to peas, beets, and onions. He had $3\frac{2}{5}$ A. of peas, and $\frac{1}{1}\frac{1}{0}$ A. of beets. How many acres of onions had he?

56. $6\frac{2}{3}$, $5\frac{1}{4}$, and how many are $16\frac{1}{4}$?

57. If 100 gal. flow from a spring in $9\frac{1}{2}$ h., what part of 100 gal. will flow from the same spring in $5\frac{3}{4}$ h.?

58. In repairing a culvert, a pile of stone $3\frac{1}{2}$ ft. long, 3 ft. wide, and 3 ft. high was used. What part of a cord of stone was used?

59. At $\$\frac{4}{5}$ for $\frac{4}{5}$ of a pound of English breakfast tea, how much will $\frac{1}{2}$ of a pound cost?

60. The pier of a bridge is 24 feet high, and $\frac{2}{3}$ of this height is twice the height of the part under water. What part of the pier is above water?

61. At $7 a barrel, how many barrels of flour must be given for $\frac{2}{3}$ of a hogshead of W. I. molasses, at $72 a hogshead?

62. Two men purchased a load of potatoes, one paying $4, the other $3. What part of the load ought each to have?

63. Three men pay $20 for the use of a piece of land, from which they harvest 300 bushels of wheat. A pays $6, B $9, and C $5. How many bushels of wheat ought each to have?

64. Two men joined in a business transaction, A furnishing twice as much money as B, and they made $600. How much was the share of each?

65. B put $200 into a certain business, and after 1 year A put $400 into the business with him. At the end of two years their whole profits were $600. How much was each partner's share?

66. Three men hire a pasture together, paying $40. A put in a horse, B 4 cows, and C 40 sheep, the men agreeing that 2 cows should be considered equal to one horse, and 4 sheep to 1 cow. What ought each to pay?

67. A and B agreed to harvest a field of wheat for $125. A sent 4 men for 5 days, and B 5 men for 6 days. How much ought each to have?

68. A, B, and C enter upon a speculation, A investing $50 and B $70. They gain $120, of which B's share is $48. What should A and C each receive, and what does C invest?

69. A, B, and C commence trade together, A investing twice as much, and C three times as much as B. They gain $720. How much ought each to receive?

70. A merchant tailor's sales amount to $12,000 a year; his average profits are 20% of his sales, and his store expenses are 25% of his profits. How much is his net gain?

71. A man sold a horse, which cost him $150, for $10 more than ⅓ of cost. What % did he make?

72. An agent, whose commission is 8%, receives $5,427 from his principal. How much of this sum will he retain for his commission, and how much will he expend for his principal?

73. 16⅔% of a certain farm is woodland, 10% of it is under tillage, and the remainder, which is 110 acres, is in meadow and pasturage. Of how many acres does the farm consist?

74. A grocer sold eggs at $.20 a doz., which was 16⅔% less than cost. For what should he have sold them, to make 16⅔%?

75. A sleigh maker sold a cutter, which cost him $25, at 144% advance, and another for $45, which was 25% less than cost. How much was his total gain or loss in the two transactions?

76. A person found a knife, and no one claiming it, he sold it for $.25. What % did he make?

77. A tax of $10 is levied on persons assessed for the following amounts of property: $50, $25, $75, $40, $60, $25, $125, $150, and $250. What is each one's share of the tax?

78. What is the amount of $500 for 4 yr. 7 mo. 15 da., at 8%?

79. In 7 yr., at 8%, what principal will amount to $117?

80. For how long a time must $84 be at interest, at 10%, to amount to $112?

81. A druggist buys perfumery at ⅓ off. What % does he make by selling it at the regular price?

82. A gentleman wishing to buy a coat, agrees to pay the merchant any price he may ask for the cloth, less 100%. What will the cloth cost?

83. Wool that cost $.42 per pound, shrunk 44% in cleansing, and after being cleansed, was sold at 33⅓% above cost. At what price per pound was it sold?

84. When the sum of two parts, and one of the parts are given, how is the other part found?

85. When the sum of any number of parts, and all the parts but one are given, how is that part found?

86. When the difference and minuend are given, how is the subtrahend found?

87. When the subtrahend and remainder are given, how is the minuend found?

88. When the greater of two numbers, and their difference are given, how is the less number found?

89. When the less of two numbers, and their difference are given, how is the greater number found?

90. To what, in addition, does the minuend in subtraction correspond? To what do subtrahend and remainder correspond?

91. How is the product of any number of factors found?

92. When the product and one of two factors are given, how is the other factor found?

93. When the product of several factors, and all the factors but one are given, how is that factor found?

94. When the product and multiplier are given, how is the multiplicand found?

95. When the product and multiplicand are given, how is the multiplier found?

96. When the dividend and quotient are given, how is the divisor found?

97. When the divisor and quotient are given, how is the dividend found?

98. What terms in multiplication and division correspond to each other?

99. What processes in multiplication and division are converse operations?

# MANUAL

OF

# METHODS AND SUGGESTIONS.

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*TO TEACHERS.*—This Manual contains hints and suggestions intended to aid you in the successful use of the book. Many suggestions valuable in mental work will be found in the Manuals of the other books of this Series, which, to avoid repetition, have been omitted from this work.

The Methods given in this Manual as models of solution are brief, strictly logical, and in accordance with the true philosophy of development; but experience teaches that it is not best to require pupils to adhere rigidly to any one method. Encourage them to solve problems in various ways: *an original solution, if correct, is better than any memorized formula.*

*Page 9.*—Give exercises in writing and reading numbers in the following order:

1*st.* Numbers expressing hundreds only;
2*d.* Numbers expressing hundreds and tens;
3*d.* Numbers expressing hundreds and ones;
4*th.* Numbers expressing hundreds, tens, and ones.

Require pupils to master thoroughly each of these classes of numbers, in order, before passing to the next.

*Page 11.*—Pupils who have been through the First Lessons in Numbers, in this Series, or any similar work, may omit Sections II., III., IV., V., and VI., and commence at Review Problems, page 52.

*Page 15.* Problem 59.—These ten exercises are intended as a substitute for the Addition Table. First require the class in concert, and then each pupil, to recite a set of combinations repeatedly, till all can recite them correctly and rapidly. The combinations may be mastered in three steps, as follows:

*First Step.*—1 and 1 are 2, 2 and 1 are 3, 3 and 1 are 4, 4 and 1 are 5, and so on, to 10 and 1 are 11; then reversing the order, 10 and 1 are 11, 9 and 1 are 10, 8 and 1 are 9, and so on, to 1 and 1 are 2.

*Second Step.*—1 and 1 are 2, 1 and 2 are 3, 1 and 3 are 4, . . . . . 1 and 10 are 11, 1 and 9 are 10, 1 and 8 are 9. . . . . .

*Third Step.*—1 and 1 are 2, 2 and 1 or 1 and 2 are 3, 3 and 1 or 1 and 3 are 4, 4 and 1 or 1 and 4 are 5 . . . . . 10 and 1 or 1 and 10 are 11, 9 and 1 or 1 and 9 are 10, 8 and 1 or 1 and 8 are 9. . . . . .

*Page 17.* Problem 93.—The suggestions under the last reference may be applied to drills upon this and the next four pages.

*Page 21.* Problem 192.—Pupils will acquire familiarity with the combination of any two figures, by being questioned in the following manner:—When 1 is added to any number whose right-hand figure is 0, what is the right-hand figure of the sum? What is it, when the right-hand figure is 1?

What, when it is 2? When it is 3? 4? etc. What is the right-hand figure of the sum, when 2 is added to any number whose right-hand figure is 0? 1? 2? 3? etc. Ask similar questions for 3, 4, 5, etc.

*Page 27.* Problem 65.—These ten exercises are intended as a substitute for the Subtraction Table. A method of drill should be adopted for these combinations, similar to the method for those in addition given on page 171.

*Page 30.* Problem 103.—Suggestions under the last reference may be applied to drills upon the combinations given in the exercises on the next five pages.

*Page 41.* Problem 61.—The next nine problems are intended as a substitute for the Multiplication Table. These drills should be graded in three steps, as follows:

*First Step.*—Once 2 is 2, 2 times 2 are four, 3 times 2 are 6, 4 times 2 are 8 . . . . . 10 times 2 are 20: then reversing the order, 10 times 2 are 20, 9 times 2 are 18, 8 times 2 are 16, . . . . . once 2 is 2.

*Second Step.*—2 times 1 are 2, 2 times 2 are 4, 2 times 3 are 6, 2 times 4 are 8, and so on: 2 times 10 are 20, 2 times 9 are 18, 2 times 8 are 16, and so on.

*Third Step.*—Once 2 or 2 times 1 are 2, 2 times 2 are 4, 3 times 2 or 2 times 3 are 6, 4 times 2 or 2 times 4 are 8, and so on: 10 times 2 or 2 times 10 are 20, 9 times 2 or 2 times 9 are 18, 8 times 2 or 2 times 8 are 16, and so on.

*Page 42.* Problem 3.—Lead the pupil to deduce the process of division from subtraction. Thus, in this problem, 1 load of 3 hogsheads taken from 12 hogsheads leaves 9 hogsheads, 1 load more taken leaves 6 hogsheads, and so on. Then he has taken 1 load, and 1 load, and 1 load, and 1 load, or 4 loads.

*Page 51.* Problem 122.—The remaining exercises in this Section, commencing with 119, are a substitute for both forms of the Division Table. These drills may be graded in three steps, as follows:

*First Step.*—Require the pupil to go through with each exercise separately, until he makes no mistakes; thus, Exercise 119,—2 in 2 once, 2 in 4 2 times, 2 in 6 3 times, 2 in 8 4 times, and so on; then, reversing the order, 2 in 20 10 times, 2 in 18 9 times, 2 in 16 8 times, and so on.

Exercise 122,—½ of 2 is 1, ½ of 4 is 2, ½ of 6 is 3, ½ of 8 is 4, and so on; and ½ of 20 is 10, ½ of 18 is 9, ½ of 16 is 8, and so on.

*Second Step.*—Require the pupil to change divisor and quotient with each dividend. Thus, Exercise 119,—2 in 2 once, 2 in 4 2 times, 2 in 6 3 times and 3 in 6 2 times, 2 in 8 4 times and 4 in 8 2 times, and so on; 2 in 20 10 times and 10 in 20 2 times, 2 in 18 9 times and 9 in 18 2 times, 2 in 16 8 times and 8 in 16 2 times, and so on.

Exercise 122,—½ of 2 is 1, ½ of 4 is 2, ½ of 6 is 3 and ½ of 6 is 2, ½ of 8 is 4 and ½ of 8 is 2, ½ of 10 is 5 and ½ of 10 is 2, and so on; ½ of 20 is 10 and $\frac{1}{10}$ of 20 is 2, ½ of 18 is 9 and ½ of 18 is 2, ½ of 16 is 8, and ½ of 16 is 2, and so on.

*Third Step.*—Combine the exercises that contain the same results, as Exercises 119 and 122, 120 and 123, and so on,—and recite them as follows—taking Exercises 120 and 123 for example:—3 in 3 once, ½ of 3 is 1; 3 in 6 2 times and 2 in 6 3 times, ½ of 6 is 2 and ½ of 6 is 3; 3 in 9 3 times, ½ of 9 is 3; 3 in 12 4 times and 4 in 12 3 times, ½ of 12 is 4 and ½ of 12 is 3; 3 in 15 5 times and 5 in 15 3 times, ½ of 15 is 5 and ½ of 15 is 3; and so on; then in reverse order, 3 in 30 10 times and 10 in 30 3 times, ½ of 30 is 10 and $\frac{1}{10}$ of 30 is 3; 3 in 27 9 times and 9 in 27 3 times, ½ of 27 is 9 and ½ of 27 is 3: and so on.

*Page 53.* Problems 15, 16.—It is good practice to require pupils to draw diagrams for use in solving problems like these two; also, to require them to solve problems in as many different ways as possible.

*Page 55.* Problem 44.—Require pupils to recite the factors of all the composite numbers in order, to 100 inclusive. See Factor Table, First Lessons in Numbers, page 107.

*Page 56.* Problem 66.—The drill upon each of these 5 sets of exercises should be in two steps.

*First Step.*—Let the pupils recite each exercise, thus—5 is $\frac{1}{2}$ of 2 times 5 or 10, 5 is $\frac{1}{3}$ of 3 times 5 or 15, 5 is $\frac{1}{4}$ of 4 times 5 or 20, and so on; then reversing the order, 5 in $\frac{1}{10}$ of 10 times 5 or 50, 5 is $\frac{1}{9}$ of 9 times 5 or 45, 5 is $\frac{1}{8}$ of 8 times 5 or 40, and so on.

*Second Step.*—5 is $\frac{1}{2}$ of 10, 5 is $\frac{1}{3}$ of 15, 5 is $\frac{1}{4}$ of 20, and so on; and then, 5 is $\frac{1}{10}$ of 50, 5 is $\frac{1}{9}$ of 45, 5 is $\frac{1}{8}$ of 40, and so on.

*Page 56.* Problem 80.—Pupils should complete this book to this place, before commencing the study of the Common School Arithmetic. From this place the same subjects in the two books should be studied in connection.

*Page 65.* Problem 18.—Give pupils considerable practice in separating given dividends into parts which are exact multiples of the given divisors. Thus $84 \div 7$, $84 = 70 + 14$; $56 \div 4$, $56 = 40 + 16$; $96 \div 6$, $96 = 60 + 36$.

*Page 84.* Liquid Measure.—Every school-house should be supplied with the following weights and measures, to be used by the pupils while learning the tables of Compound Numbers: a liquid pint, a quart, and a gallon measure of tin; a dry quart, $\frac{1}{4}$ peck, peck, and $\frac{1}{4}$ bushel measure of wood, and a bushel basket; a foot-rule divided into inches, a yard-stick, and a tape measure or string at least 1 rod long; a cubic inch, and a cubic-foot, of wood or pasteboard; a balance or a pair of pastry scales with 1 oz., 2 oz., 4 oz., 8 oz., 1 lb., 2 lb., and 4 lb. weights (or if the scales and weights can not be had, sacks of sand or shot of these several weights distinctly marked).

*Page 94.* Time.—Children have an imperfect appreciation of the three smallest denominations of time. It will be found a good exercise to require them, first in concert, then singly, to beat and audibly count seconds, first 10 seconds, then 20, then 30 or $\frac{1}{2}$ minute. After this, require them to count silently $\frac{1}{2}$ minute, then a minute, and to raise hands when they are through, the exact time being noted by the time-piece. Again, all the school may be required to sit still 1 minute, then 2, 3, 4, and 5 minutes successively.

*Page 96.* Problems 106, 107.—Give several problems like these two, showing that the length of the day, *i. e.*, from sunrise to sunset, is equal to double the time of the sun's setting; and the length of the night, *i. e.*, from sunset to sunrise, is equal to double the time of the sun's rising.

*Page 139.*—Problems 16, 17, 18 illustrate the manner in which the conditions of a problem may be so varied as to form several problems. Each of the problems in Sections I. and II. should be varied in a similar manner by the class.

*Page 141.* Problem 1.—These problems in Reductions may be made to afford double practice, by requiring pupils to form and solve the converse of each.

*Page 144.* Problem 3.—In Percentage, require pupils to give the per cent, first in hundredths, and then in a common fraction reduced to its lowest terms.

*Page 158.* Problem 34.—Require pupils to form and solve the converse of each of these problems.

# METHODS.

***Page 11.*** *1.* (1.) There are 5 boys in the group; because 3 boys and 2 boys are 5 boys. Or,

(2.) There are in the group 3 boys and 2 boys, which are 5 boys.

*2.* 1 tree and 2 trees are 3 trees.

***Page 12.*** *22.* (1.) He shot 12 birds; because pigeons and quails are birds, and 10 birds and 2 birds, are 12 birds. Or,

(2.) Since pigeons and quails are birds, he shot 10 birds and 2 birds, which are 12 birds.

***Page 22.*** *1.* We can see two large windows; because 1 window from 3 windows leaves 2 windows.

*5.* (1.) 2 are girls; because 2 children, the boys, from the 4 children leave 2 children, the girls.

(2.) 4 children less 2 children, the boys, are 2 children, the girls.

***Page 23.*** *11.* (1.) He has 5 doves; because 2 doves from 7 doves leave 5 doves. Or,

(2.) He has 7 doves less 2 doves, which are 5 doves.

***Page 26.*** *46.* 7 and 4 more are 11; because 7 from 11 leaves 4.

***Page 29.*** *92.* 54—9 is the greater; because 54—9=45, and 49—6=43, and 45 is greater than 43.

***Page 35.*** *1.* (1.) He expended 16 cents; because 5 cents, 4 cents, and 7 cents are 16 cents. Or,

(2.) He expended 5 cents, 4 cents, and 7 cents, which are 16 cents. Or,

(3.) He expended the sum of 5 cents, 4 cents, and 7 cents, which is 16 cents.

*9.* (1.) He has given away 5 peaches and 4 peaches, which are 9 peaches; and he has left 9 peaches less 9 peaches, which are 0 peaches. Or,

(2.) From the 9 peaches, he gave 5 to Adah, which left him 4 peaches. Then from the 4 peaches, he gave 4 to Juliet, which leaves him 0 peaches.

***Page 35.*** *12.* When the tide rises 7 feet, the rock will be 7 feet and 7 feet, or 14 feet, under water; and afterward, when it falls 9 feet, the rock will be 14 feet less 9 feet, or 5 feet, under water.

***Page 38.*** *16.* (1.) They will cost \$16; because 2 times \$8 are \$16. Or,

(2.) They will cost 2 times \$8, which are \$16.

***Page 42.*** *5.* (1.) You can buy 4 peaches; because 2 cents are contained in 8 cents 4 times. Or,

(2.) Since the number of times 2 cents are contained in 8 cents equals the number of peaches, and 2 cents are contained in 8 cents 4 times, you can buy 4 peaches.

***Page 43.*** *22.* (1.) There will be 4 cows; because $\frac{1}{2}$ of 8 cows is 4 cows. Or,

(2.) In each pasture there will be $\frac{1}{2}$ of 8 cows, which is 4 cows.

***Page 52.*** *2.* In 4 weeks the father earns 4 times \$9, or \$36; in 1 week the son earns \$4; and both earn in all \$36 and \$4, which are \$40.

***Page 53.*** *9.* He sold the 4 melons for 4 times 9 cents, or 36 cents; and the slate cost him 36 cents less 6 cents, which are 30 cents.

***Page 54.*** *32.* It will take 9 times as many men to dig the ditch in 1 day as to dig it in 9 days, and 9 times 3 men are 27 men.

*41.* 4 times 9 are 36, and 36 is 6 times 6.

***Page 55.*** *55.* 2 times 10 are 20, and $\frac{1}{5}$ of 20 is 4.

***Page 56.*** *71.* The three barrels cost the sum of \$7, \$9, and \$11, which is \$27; and the average price is $\frac{1}{3}$ of \$27, which is \$9.

***Page 57.*** *1.* The cost of both is the sum of \$10 and \$30, which is \$40.

***Page 58.*** *8.* I paid for both the sum of 30 cents and 14 cents. 14 cents are 10 cents + 4 cents. 30 cents and 10 cents are 40 cents, and 40 cents and 4 cents are 44 cents. Hence, I paid 44 cents for both.

*17.* Both cost him the sum of 21 cents and 18 cents. 21 cents and 10 cents are 31 cents, and 31 cents and 8 cents are 39 cents. Hence, both cost him 39 cents.

***Page 59.*** *1.* He paid the difference between \$30 and \$10, which is \$20.

***Page 61.*** *17.* There was left the difference between 39 yards and 15 yards. 10 yards from 39 yards leave 29 yards, and 5 yards from 29 yards leave 24 yards. Hence, 24 yards were left in the piece.

***Page 62.*** *2.* 4 shawls will cost 4 times as much as 1 shawl, and 4 times $30 are $120.

*11.* 3 pounds will cost 3 times as much as 1 pound. 3 times 20 cents are 60 cents, 3 times 3 cents are 9 cents, and 60 cents + 9 cents are 69 cents. Hence, 3 pounds will cost 69 cents.

***Page 63.*** *17.* For 4 bales of hops 4 times as much must be paid as for 1 bale. 4 times $40 are $160, 4 times $4 are $16, and $160 + $16 are $176. Hence, $176 must be paid for 4 bales.

***Page 64.*** *2.* 1 yard will cost $\frac{1}{4}$ as much as 4 yards, and $\frac{1}{4}$ of 80 cents is 20 cents.

***Page 65.*** *11.* The daily average was $\frac{1}{3}$ of the number of bushels threshed in 3 days, that is, $\frac{1}{3}$ of 48 bushels. 48 bushels are 30 bushels + 18 bushels. $\frac{1}{3}$ of 30 bushels is 10 bushels, $\frac{1}{3}$ of 18 bushels is 6 bushels, and 10 bushels + 6 bushels are 16 bushels. Hence, the daily average was 16 bushels.

*15.* The number of times 9 loaves are contained in 108 loaves equals the number of weeks. 9 loaves are contained in 90 loaves 10 times, in 18 loaves 2 times, and 10 times and 2 times are 12 times. Hence, 108 loaves will last them 12 weeks.

***Page 77.*** *17.* Since 10 mills are 1 cent, the number of times 10 mills are contained in 87 mills equals the number of cents, and the remainder equals the number of mills. 87 mills are 80 mills (the greatest part that will contain 10 mills) and 7 mills (the remainder). 10 mills are contained in 80 mills 8 times. Hence, 87 mills are 8 cents 7 mills.

***Page 79.*** *2.* He gave the sum of $1.50, $.88, and $1.25. $1.50 and $.88 are $2.38; $2.38 and $1 are $3.38, and $3.38 and $.25 are $3.63. Hence, he gave $3.63 for all.

*7.* He had left the difference between $5.84 and $1.56. $1 from $5.84 leaves $4.84, and $.56 from $4.84 leave $4.28. Hence, he had $4.28 left.

***Page 80.*** *15.* In 6 days he will earn 6 times as much as in 1 day. 6 times $1 are $6; 6 times 75 cents are 450 cents, or $4.50; and $6 + $4.50 are $10.50. Hence, he will earn $10.50.

***Page 80.*** *20.* 1 yard will cost $\frac{1}{5}$ as much as 5 yards. $1.85 are $1.50 + $.35. $\frac{1}{5}$ of $1.50 is $.30, $\frac{1}{5}$ of $.35 is $.07, and $.30 + $.07 are $.37. Hence, 1 yard will cost $.37.

*26.* The number of times $.08 are contained in $2.24 equals the number of pounds. $2.24 are $1.60 + $.64. $.08 are contained in $1.60, 20 times, in $.64, 8 times, and 20 times + 8 times are 28 times. Hence, 28 pounds can be bought.

***Page 84.*** *2.* 7 qt. are 7 times as many pints as 1 qt., and 7 times 2 pt. are 14 pt. 14 pt. are 14 times as many gills as 1 pt., and 14 times 4 gi. are 56 gi. Hence, 7 qt. are 56 gi.

*4.* In as many days as there are gills in 4 gal. 1 qt. 1 pt. 3 gi. 4 gal. are 4 times 4 qt., or 16 qt., and 16 qt. + 1 qt. are 17 qt. 17 qt. are 17 times 2 pt., or 34 pt., and 34 pt. + 1 pt. are 35 pt. 35 pt. are 35 times 4 gi., or 140 gi., and 140 gi. + 3 gi. are 143 gi. Hence, she would use 4 gal. 1 qt. 1 pt. 3 gi. in 143 days.

***Page 85.*** *9.* He used as many gallons as are equal to 180 gills. Since every 4 gi. are 1 pt., and 4 gi. are contained in 180 gi. 45 times, 180 gi. are 45 pt. Since every 2 pt. are 1 qt., and 2 pt. are contained in 45 pt. 22 times, with a remainder of 1 pt., 45 pt. are 22 qt. 1 pt. Since every 4 qt. are 1 gal., and 4 qt. are contained in 22 qt. 5 times, with a remainder of 2 qt., 22 qt. are 5 gal. 2 qt., and 22 qt. 1 pt. are 5 gal. 2 qt. 1 pt. Hence, he used 5 gal. 2 qt. 1 pt.

***Page 88.*** *36.* A surface 4 ft. wide contains 4 times as many square feet as a surface of the same length 1 ft. wide. A surface 10 ft. long and 1 ft. wide contains 10 sq. ft., and 4 times 10 sq. ft. are 40 sq. ft. Hence, the black-board has 40 sq. ft. of surface.

*42.* Since every inch in width of the surface measures 10 sq. in., the number of times 10 sq. in. are contained in 80 sq. in. equals the number of inches in the width of the slate. 10 sq. in. are contained in 80 sq. in. 8 times. Hence, the slate is 8 in. wide.

***Page 90.*** *56.* A block 6 in. wide contains 6 times as many cubic inches as a block 1 in. wide; a block 3 in. thick contains 3 times as many cubic inches as a block 1 in. thick; and a block 12 in. long, 1 in. wide, and 1 in. thick, contains 12 cu. in. 6 times 12 cu. in. are 72 cu. in., and 3 times 72 cu. in. are 216 cu. in. Hence, the block contains 216 cu. in.

*60.* Since every foot in length, of a body 2 ft. wide and 3 ft. thick, contains 6 cu. ft., the number of times 6 cu. ft. are contained

in 72 cu. ft. equals the number of feet in the length of the box. 6 cu. ft. are contained in 72 cu. ft. 12 times. Hence, the box is 12 ft. long.

***Page 98.*** *4.* He sold the sum of 5 gal. 2 qt., 3 gal. 1 qt., and 4 gal. 2 qt. 5 gal. 2 qt. + 3 gal. are 8 gal. 2 qt., 8 gal. 2 qt. + 1 qt. are 8 gal. 3 qt., 8 gal. 3 qt. + 4 gal. are 12 gal. 3 qt., and 12 gal. 3 qt. + 2 qt. are 12 gal. 5 qt., or 13 gal. 1 qt. Hence, he sold 13 gal. 1 qt.

***Page 99.*** *2.* He had left the difference between 12 lb. 6 oz. and 5 lb. 8 oz. 12 lb. 6 oz. less 5 lb. are 7 lb. 6 oz., and 7 lb. 6 oz. less 8 oz. are 6 lb. 14 oz. Hence, he had 6 lb. 14 oz. left.

***Page 100.*** *1.* To fill 5 canisters, it will take 5 times as much as to fill 1 canister, or 5 times 2 lb. 8 oz. 5 times 2 lb. are 10 lb., 5 times 8 oz. are 40 oz., or 2 lb. 8 oz., and 10 lb. + 2 lb. 8 oz. are 12 lb. 8 oz. Hence, it will take 12 lb. 8 oz. to fill 5 canisters.

***Page 101.*** *2.* To seed 1 acre, it will take $\frac{1}{5}$ as many oats as to seed 5 acres, or $\frac{1}{5}$ of 13 bu. 3 pk. $\frac{1}{5}$ of 10 bu. is 2 bu., 3 bu. 3 pk. are 15 pk., $\frac{1}{5}$ of 15 pk. are 3 pk., and 2 bu. + 3 pk. are 2 bu. 3 pk. Hence, it will take 2 bu. 3 pk. to seed 1 acre.

***Page 110.*** *9.* 1 cu. yd. is $\frac{3}{3}\frac{7}{7}$ cu. yd., $\frac{1}{3}$ cu. yd. is $\frac{9}{2}\frac{7}{7}$ cu. yd., and the number of times $\frac{9}{2}\frac{7}{7}$ cu. yd. are contained in $\frac{1}{3}\frac{9}{7}$ cu. yd. equals the number of thirds. $\frac{9}{2}\frac{7}{7}$ cu. yd. are contained in $\frac{1}{3}\frac{9}{7}$ cu. yd. 2 times. Hence $\frac{1}{3}\frac{9}{7}$ cu. yd. are $\frac{2}{3}$ cu. yd.

***Page 111.*** *14.* Since the value of a fraction is not changed by dividing both of its terms by the same number, we divide both by the common factor 4, and obtain $\frac{7}{9}$; and since 2 and 7 are prime to each other, the fraction $\frac{7}{9}$ is in its lowest terms.

*32.* 1 lb. is $\frac{1}{1}\frac{6}{6}$ lb., $\frac{1}{8}$ lb. is $\frac{1}{8}$ as many sixteenths as 1 lb., and $\frac{5}{8}$ lb. are 5 times as many sixteenths as $\frac{1}{8}$ lb. $\frac{1}{8}$ of $\frac{1}{1}\frac{6}{6}$ lb. is $\frac{1}{1}\frac{6}{6}$ lb., and 5 times $\frac{1}{1}\frac{6}{6}$ lb. are $\frac{1}{1}\frac{6}{6}$ lb. Hence, $\frac{5}{8}$ lb. are $\frac{1}{1}\frac{6}{6}$ lb.

***Page 113.*** *59.* (1.) Since each denominator must be a factor of the common denominator, sevenths and ninths can be reduced to sixty-thirds. Multiplying both terms of $\frac{4}{7}$ by 9 gives $\frac{3}{6}\frac{6}{3}$, and both terms of $\frac{5}{9}$ by 7 gives $\frac{3}{6}\frac{5}{3}$. Hence, $\frac{4}{7}$ and $\frac{5}{9}$ equal the similar fractions, $\frac{3}{6}\frac{6}{3}$ and $\frac{3}{6}\frac{5}{3}$. Or,

(2.) Since 63 is the product of 7 and 9, sevenths and ninths can be reduced to sixty-thirds. Multiplying both terms of $\frac{4}{7}$ by 9, etc.

***Page 114.*** *84.* $\frac{1}{4}$ ft. are 1 ft., and the number of times $\frac{1}{4}$ ft. are contained in $\frac{9}{4}$ ft. equals the number of feet in $\frac{9}{4}$ ft. $\frac{1}{4}$ ft. are contained in $\frac{2}{4}$ ft. 2 times, with a remainder of $\frac{1}{4}$ ft. Hence, $\frac{9}{4}$ ft. equals $2\frac{1}{4}$ ft.

***Page 115.*** *99.* 8 is 8 times as many ninths as 1. 1 is $\frac{8}{9}$, 8 times $\frac{8}{9}$ are $\frac{72}{9}$, and $\frac{72}{9}+\frac{4}{9}$ are $\frac{76}{9}$. Hence, $8\frac{4}{9}$ are $\frac{76}{9}$.

***Page 116.*** *15.* In the two days he cut the sum of $\frac{3}{8}$ and $\frac{5}{8}$ of it. $\frac{3}{8}=\frac{42}{112}$, $\frac{5}{8}=\frac{70}{112}$, and $\frac{42}{112}+\frac{70}{112}=\frac{112}{112}$. Hence, he cut $\frac{112}{112}$ of the meadow in the two days.

***Page 118.*** *8.* He had left the difference between $\$\frac{3}{4}$ and $\$\frac{3}{5}$. $\$\frac{3}{4}=\$\frac{15}{20}$, $\$\frac{3}{5}=\$\frac{12}{20}$, and $\$\frac{15}{20}-\$\frac{12}{20}=\$\frac{3}{20}$. Hence, he had $\$\frac{3}{20}$ left.

***Page 119.*** *19.* (1.) She is now 13 yr. less $\frac{3}{5}$ yr. old. 13 yr. $=12$ yr. $+\frac{5}{5}$ yr., $\frac{5}{5}$ yr. $-\frac{3}{5}$ yr. $=\frac{2}{5}$ yr., and 12 yr. $+\frac{2}{5}$ yr. $=12\frac{2}{5}$ yr. Hence, she is now $12\frac{2}{5}$ yr. old. Or,

(2.) She is now 13 yr. less $\frac{3}{5}$ yr. old. 13 yr. $=\frac{65}{5}$ yr., and $\frac{65}{5}$ yr. $-\frac{3}{5}$ yr. $=\frac{62}{5}$ yr., or $12\frac{2}{5}$ yr. Hence, etc.

*24.* He had left the difference between $11\frac{1}{4}$ bu. and $7\frac{7}{12}$ bu. $11\frac{1}{4}$ bu. $=10$ bu. $+1\frac{1}{4}$ bu. or $\frac{5}{4}$ bu. or $\frac{15}{12}$ bu. $\frac{15}{12}$ bu. $-7\frac{7}{12}$ bu. $=7\frac{8}{12}$ bu., or $\frac{2}{3}$ bu., and 10 bu. $+\frac{2}{3}$ bu. $=10\frac{2}{3}$ bu. Hence, he had $10\frac{2}{3}$ bu. left.

***Page 120.*** *3.* 6 bu. will cost 6 times as much as 1 bu., or 6 times $\$\frac{3}{5}$. 6 times $\$\frac{3}{5}$ are $\$\frac{18}{5}$, or $\$2\frac{3}{5}$. Hence, 6 bu. will cost $\$2\frac{3}{5}$.

***Page 121.*** *24.* 15 bar. will cost 15 times as much as 1 bar., or 15 times $\$7\frac{7}{10}$. 15 times \$7 are \$105; 15 times $\$\frac{7}{10}$ are $\$\frac{105}{10}$, or $\$10\frac{1}{2}$; and $\$105+\$10\frac{1}{2}$ are $\$115\frac{1}{2}$. Hence, 15 bar. will cost $\$115\frac{1}{2}$.

*29.* $\frac{1}{8}$ cd. will cost $\frac{1}{8}$ as much as 1 cd., or $\frac{1}{8}$ of \$5. $\frac{1}{8}$ of \$5 is 5 times as much as $\frac{1}{8}$ of \$1. $\frac{1}{8}$ of \$1 is $\$\frac{1}{8}$, and 5 times $\$\frac{1}{8}$ are $\$\frac{5}{8}$. Hence, $\frac{1}{8}$ cd. will cost $\$\frac{5}{8}$.

***Page 122.*** *57.* $\frac{3}{4}$ lb. will cost 3 times $\frac{1}{4}$ of the cost of 1 lb., or 3 times $\frac{1}{4}$ of 60 cents. $\frac{1}{4}$ of 60 cents is $7\frac{1}{2}$ cents, and 3 times $7\frac{1}{2}$ cents are $22\frac{1}{2}$ cents. Hence, $\frac{3}{4}$ lb. will cost $22\frac{1}{2}$ cents.

***Page 123.*** *68.* In $2\frac{3}{4}$ h. a train will run $2\frac{3}{4}$ times as far as in 1 h., or $2\frac{3}{4}$ times 24 mi. 2 times 24 mi. are 48 mi., $\frac{3}{4}$ times 24 mi. are 18 mi., and 48 mi. $+18$ mi. are 66 mi. Hence, the train will run 66 mi.

*80.* $\frac{3}{4}$ gal. will cost 3 times as much as $\frac{1}{4}$ gal. or 3 times $\frac{1}{4}$ of $\$\frac{1}{5}$. $\frac{1}{4}$ of $\$\frac{1}{5}$ is $\$\frac{1}{20}$, and 3 times $\$\frac{1}{20}$ are $\$\frac{3}{20}$. Hence, $\frac{3}{4}$ gal. will cost $\$\frac{3}{20}$.

***Page 124.*** *97.* $\frac{3}{7}$ of $\frac{7}{8}$ yd. are 3 times as much as $\frac{1}{7}$ of $\frac{7}{8}$ yd. $\frac{7}{8}$ yd. $=\frac{35}{40}$ yd., $\frac{1}{7}$ of $\frac{35}{40}$ yd. is $\frac{5}{40}$ yd., and 3 times $\frac{5}{40}$ yd. are $\frac{15}{40}$ yd. Hence, $\frac{3}{7}$ of $\frac{7}{8}$ yd. are $\frac{15}{40}$ yd.

*Page 127. 55.* (1.) The number of times $\$\frac{1}{4}$ are contained in $\$4$, equals the number of bushels. $\$4=\$\frac{40}{4}$, and $\$\frac{1}{4}$ are contained in $\$\frac{40}{4}$ 10 times. Hence, 10 bushels can be bought. Or,

(2.) The number of times $\$\frac{1}{4}$ are contained in $\$4$ equals the number of bushels. $\$\frac{1}{4}$ are contained in $\$4$ $\frac{1}{4}$ as many times as $\$\frac{1}{4}$. $\$\frac{1}{4}$ is contained in $\$1$ 8 times, in $\$4$ 4 times 8 or 32 times, and $\frac{1}{4}$ of 32 times are $\frac{32}{4}$ times, or 10 times. Hence, etc.

*Page 130. 118.* (1.) The number of times $\$\frac{1}{12}$ is contained in $\$\frac{7}{12}$ equals the number of gallons. $\$\frac{1}{12}=\$\frac{1}{12}$, and 4 twelfths of a dollar are contained in 7 twelfths of a dollar $\frac{7}{4}$, or $1\frac{3}{4}$ times. Hence, $1\frac{3}{4}$ gallons can be bought. Or,

(2.) The number of times $\$\frac{1}{12}$ is contained in $\$\frac{7}{12}$ equals the number of gallons. $\$\frac{1}{12}$ is contained in $\$1$ 3 times, in $\$\frac{1}{12}$ $\frac{1}{12}$ of 3 times, and in $\$\frac{7}{12}$ 7 times $\frac{1}{12}$ of 3 times. $\frac{1}{12}$ of 3 times is $\frac{1}{4}$ time, and 7 times $\frac{1}{4}$ time are $1\frac{3}{4}$ times. Hence, etc.

*Page 132. 166.* The number of times $1\frac{1}{3}$ lb. are contained in $11\frac{1}{3}$ lb. equals the number of days. $11\frac{1}{3}$ lb.$=\frac{34}{3}$ lb., $1\frac{1}{3}$ lb.$=\frac{4}{3}$ lb., and 5 thirds of a pound are contained in 35 thirds, etc.

*Page 141. 2.* $\frac{1}{2}$ gal.$=\frac{1}{2}$ of 4 qt. are $\frac{4}{2}$ qt., or $2\frac{1}{2}$ qt.; $\frac{1}{2}$ qt.$=\frac{1}{2}$ of 2 pt., or 1 pt.; and 2 qt.$+1$ pt.$=2$ qt. 1 pt. Hence, $\frac{1}{2}$ gal.$=1$ qt. 1 pt.

*Page 143. 21.* 1 qt. is $\frac{1}{4}$ pk., 5 qt. are $\frac{5}{4}$ pk., and 1 pk.$+\frac{5}{4}$ pk.$=1\frac{5}{4}$ pk., or $\frac{9}{4}$ pk. 1 pk. is $\frac{1}{4}$ bu., and $\frac{9}{4}$ pk. are $\frac{9}{4}$ times $\frac{1}{4}$ bu., or $\frac{9}{16}$ bu. Hence, 1 pk. 5 qt.$=\frac{9}{16}$ bu.

*Page 145. 3.* Since 25% are $\frac{25}{100}$, he sold $\frac{25}{100}$ or $\frac{1}{4}$ of 500 bushels, which is 125 bushels.

*Page 146. 14.* 150 sheep are $\frac{150}{450}$, or $\frac{1}{3}$ of 450 sheep. Since 450 sheep are 100 %, 150 sheep are $\frac{1}{3}$ of 100%, or $33\frac{1}{3}$%.

*Page 147. 25.* (1.) Since he gained $500 by selling at 25% above cost, $500 is 25% or $\frac{1}{4}$ of the cost, and the whole cost is 4 times $500, or $2,000. Or,

(2.) Since $500 are 25% of the cost, 100%, the whole cost, is 100 times $\frac{1}{25}$ of $500, which is $2,000.

*33.* Since the maple wood is worth 20% more than the oak, it is worth $\$7.50+20$%, or $\frac{1}{5}$ of $7.50. $\frac{1}{5}$ of $7.50 is $1.50, and $7.50+$1.50 are $9. Hence, the maple wood is worth $9 a cord.

*Page 148. 40.* 9,000 lb. are 100%$+50$%, or 150% of the number of pounds he bought at the first factory; and 150% is $\frac{150}{100}$, or $\frac{3}{2}$. 9,000 lb. are $\frac{3}{2}$ of 2 times $\frac{1}{3}$ of 9,000 lb., which are 6,000 lb. Hence, he bought 6,000 lb. at the first factory.

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